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ON

TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIATRICS,
OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS,
PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY,
OTOLOGY, RHINOLOGY, LARYNGOLOGY,
HYGIENE, AND OTHER TOPICS OF INTEREST
TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION
THROUGHOUT THE WORLD

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Treatment

THE TREATMENT OF NEPHRITIS *

BY ROBERT N. WILLSON, M.D.

Philadelphia

IN dealing with the treatment of renal disabilities, it will be necessary at the outset to establish the fact that, except in the case of acute inflammation, we are called upon to handle the results of nephritis, and not nephritis itself, as a concrete thing. Just as certain and vital, therefore, as the damage beyond repair to structures essential to health, and even to life, is the principle that the only effectual treatment of all other forms than acute renal disease consists in our recognizing the underlying etiologic conditions and the institution of prevention as the only form and means of cure.

It will be well, in passing, to refresh our memories with regard to the finer renal structure (see Fig. 1, *Piersol*) and, in so doing, to recall the fact that the main recognized function of the glomerulus is the secretion of the watery elements; while that of the epithelium of the tubules is the extraction from the circulation (blood and lymph) of the substances that form the solids of the urine. In order to flush and cleanse the whole passageway to the calyx and the renal pelvis, the glomerule, with its water supply, is situated at the head or beginning of the tubule.

It is also of importance to recollect that a quantity of blood flows through the kidney each minute, almost corresponding in weight to the kidney itself. Under such circumstances congestion will depend upon trifling causes. Finally, it is of interest and importance to remember, especially from the standpoint of possible renal infection, that the inferior limbs of the pleuræ often approximate and cover the upper surfaces of the kidneys; and that the duodenum and the colon are in intimate relation.

* Read before the College of Physicians of Philadelphia, March, 1913.

The term nephritis is usually employed to indicate a permanent chronic pathologic condition that is no more a true nephritis than it is amenable to effective treatment or cure. Not only have the essential structures of both the glomeruli and tubules been destroyed, but their nourishing blood-supply has been cut off, and their regeneration or replacement thus rendered impossible. We are therefore impaled upon the sharp horns of a crowding dilemma. The vascular, epithelial, and intertubular renal structures are in constant use, never at rest, and indispensable to healthy existence. At the same time there is an increasing tendency to such habits of life in the way of eating and drinking, of drug indulgence, of overwork and overworry, too little physical and nervous relaxation, as result in toxic influences and conditions that seem to assemble and collect their forces for an attack as vicious as it is gradual and insinuating, upon peculiarly defenceless, vital agencies. It is almost as if there were working in the field an army of industrious and almost untiring peasant folk when suddenly there begins a poisoning of their food and drink, of the very air they breathe, and in a little time even the tainted supply of nutriment is cut off. Already weakened by improper and poisoned food, these little cell peasants starve and die, and, the fountain-head of their source and origin having been also destroyed, their replacement is impossible except by a type of tissue that is neither capable of performing their function, nor of acting even a negatively harmless rôle. This new tissue immediately begins to contract and to compress neighboring tissues, and to crowd and pinch them out of room. Therefore, the inevitable condition must be faced, of a need imposed upon the vital forces of carrying on the processes of life in the absence of structures that are almost essential to its continuance and absolutely indispensable to its well-being. On its face this is an impossible task. We are forced to recognize that, except by prevention, these conditions ordinarily termed chronic nephritis are incurable states. Only a makeshift can be instituted in the way of alleviation of symptoms and a substitution for a little time of vicarious aid on the part of the other organs and forces.

The essential importance of this preliminary platform and the necessity of realizing its significance in the handling of renal disease become apparent when we study first the intricate renal mechanism, and next its duties as outlined in the gross and the microscopic renal

FIG. 1.

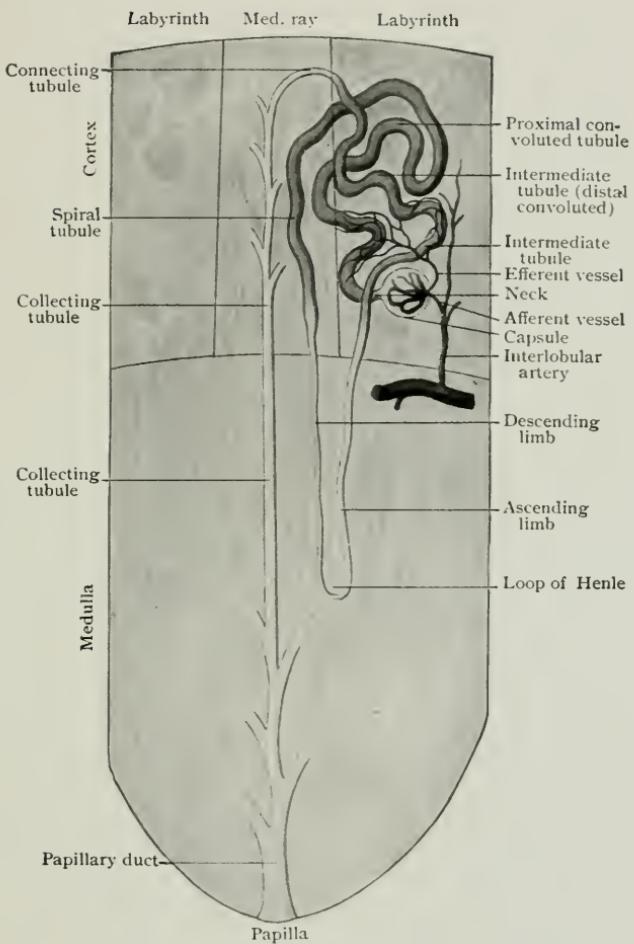


Diagram showing course of uriniferous tubule. (Piersol.)

specimen. Even in the kidney of acute inflammation (whether of chemical or bacterial origin) we see changes so marked and damage so widespread that it appears little likely that there can be perfect replacement or repair. The clinical events demonstrate that often-times such repair does not take place. In other cases there seems to be a complete reëstablishment. Probably the only instances that we see of acute inflammation of strictly healthy kidneys are in children. Of these, very many (about one-third) die. Of those who recover (as the word is used), many have a renal disability, demonstrable or latent, to which, later on, they succumb. A very few seem to have suffered no permanent harm. Probably in the latter the actual destructive processes have not been carried on to any marked extent.

When we pass to chronic renal disease of the parenchymatous and interstitial types, we begin at once to deal with states in which the kidneys are damaged beyond repair. They may even be guilty of more than the nonperformance of duty, and may manufacture, in diseased conditions, what have often been termed nephrotoxins, to the further disabling of the body.

Three other points should be emphasized by way of preliminary:

First, that there probably never occurs, even in childhood, an instance of purely parenchymatous or purely interstitial renal disease. The degeneration of the glomerular and tubular epithelial cells may preponderate, or the process may appear to mainly concern the inter-tubular structures; but, in either event, renal disease means disease of all the kidney tissues, and always, as in the case of liver, or lung, or splenic involvement, we have a mixed pathologic and clinical picture. We call the one parenchymatous and the other interstitial disease simply for the lack of a more intelligent method of describing the leaning of the individual case toward one type or the other.

Second, and of great importance from the double standpoint of treatment and prognosis, is the too little appreciated fact that the chronic forms of renal disease are usually only portions of clinical and pathologic pictures. By this I mean that in most instances the same process that has involved the kidney is also attacking the other vital organs; or, as in the case of the arteriosclerotic granular kidney, the kidney fibrosis is simply one feature of the systemic circulatory disease.

The *third* point is that, in the vast majority of instances, the indi-

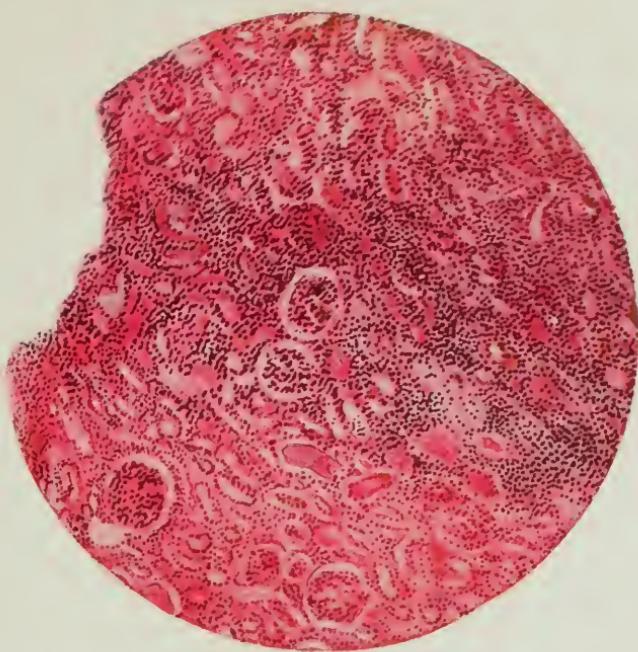
vidual case presents itself for treatment only at a time in which prevention is as frankly out of the question as cure; leaving the sole possibility of an attempt to substitute other organs and functions, and to secure the postponement of the inevitable, sometimes for weeks, sometimes for many years. Given an individual with extensive degeneration and loss of the glomerular and tubular epithelium, and a marked contraction of the blood-supply, and it is a question whether the physician is likely to be much more than a witness of the steady progress of the patient toward toxæmia and disablement of the vital centres. On the other hand, in an instance of incipient chronic interstitial fibrosclerosis of the kidney the length of life and degree of comfort and activity that can be vouchsafed, after the diagnosis has been made, are very remarkable. Even here, however, as always in renal disease, the rôle of the physician is more one of prevention than of cure, of hygiene rather than of medicaments or mechanical methods.

ACUTE NEPHRITIS

Acute nephritis is, ordinarily, an incident, though often a serious one, in the course of some bacterial blood infection, whether in scarlatina, pneumonia, typhoid, diphtheria, syphilis, malaria, or other infectious disease. It may be either a unilateral or a bilateral suppurative process, occurring in the form of an abscess or of multiple metastatic abscesses, or it may, and usually does, consist of a diffuse inflammation (Fig. 2). In the former type surgical intervention and Providence furnish the only hope of cure. In the latter, skilful treatment may go far toward assisting Nature in resisting an attack upon the renal tissues and in her effort at repair.

The onset of acute nephritis is usually without warning, and admits of little more in the way of preparation than a general watchfulness for the signs of renal disability. An intelligently chosen and measured dietary will guard against internal treachery on the digestive side. Both in the acute and chronic forms of nephritis a clean bowel goes far toward prophylaxis, ensuring a minimum of toxæmia and serving as an active preventive of all unnecessary renal activity, once the onset has made known the state of affairs. A wide-open system of pores proves invaluable in affording a free outlet for waste materials through the skin. But in spite of these hygienic measures the kidneys

FIG. 2.



Pyelonephritis: note the widespread round-cell and leucocytic infiltration.

FIG. 3.



Embolic nephritis: note the stoppage of the vessel by an infecting embolus; also the leucocytic infiltration of the tissues.

often suffer grievously in acute infectious disease, and oftentimes recovery from the effects of the latter is only secured at the cost of an embarrassed or crippled renal mechanism.

Acute nephritis may also occur independently of a recognized systemic disease. In such instances it is very frequently a colon bacillus infection, as may be demonstrated by systematic study of the urine. Probably most instances of primary acute nephritis are of this type, even though apparently following and resulting from exposure, bodily exhaustion, or similar influences.

The treatment of the attack consists of the employment of many of the same measures that were used in the days of *Æsclepiades*. Diet, regulation of exercise, and bathing were his trio of indispensables. Occasionally he accompanied these by purging and bleeding, or by the use of a bland drug. Our fathers imitated this ancient hygienist, and we are still prescribing absolute rest in bed, starving, bathing, sweating, purging, bleeding, cupping, and occasionally administering a harmless medicament. The fact is plain, that our treatment of acute nephritis is necessarily limited to an attempt to relieve the kidneys of all unnecessary duties, Dame Nature being relied upon to conserve the essential renal tissues as best she may. In grave toxic states with marked arterial hypertension, bleeding, and complete withdrawal of the spinal fluid by lumbar puncture, may give immediate relief. From the latter measure especially I have seen prompt and gratifying results both in children and adults. At the present time I am watching and studying a uræmic patient (a man, 62 years of age), who has twice been relieved immediately of his stupor, cervical and general rigidity, and of a toxic and pressure irritability of the motor (left arm and leg) centres in the cortex, by the withdrawal of all the fluid in his spinal canal. He is one of many similar hypertension instances. Patients with low arterial tension have in my experience usually obtained harm rather than benefit from lumbar puncture.

As complete a sterilization of the urine as is feasible is often of the greatest benefit. Hexamethylenamine, salol, and acetozone constitute three drugs any of which can be employed with the certainty of elimination through the tubules of the kidney if the tubular epithelium is still capable of performing its function. Oftentimes the microscope will demonstrate in a kidney involved in an infectious

nephritis clumps of bacteria in the coils of the glomeruli, in the tubules, and in the form of emboli in the vessels. How effective urinary anti-septics are in reaching these bacterial foci is, of course, beyond the realm of demonstration. The attempt is at least intelligent and should be made (Fig. 3).

Surgical measures have also been called into play. Capsule-splitting and decapsulation, with or without omental investment, have both been offered as means of relief from otherwise fatal mechanical kidney tension, and consequent interference with the renal circulation. No one can say, however, at the present writing, whether in a given case surgical interference will prove a means of saving life or the additional burden that will carry the patient over and beyond all hope of cure. In certain instances it would seem as though the surgeon had not only saved life, but had afforded just the respite from renal embarrassment that has been necessary to tide the patient over into a new lease of both life and health. It would appear that to gain the full advantage from either capsule-splitting or decapsulation surgical interference should not be delayed until the patient is moribund. Given an individual in whom suppression of urine appears more and more imminent, in whom toxæmia is already under way, purging, bleeding, and lumbar puncture, and all medical measures, including hot normal sodium bicarbonate or normal saline enemata, having failed to stay the progress of the renal insufficiency,—this would seem to be the case and the psychological moment in which to employ surgical help, rather than to delay until uræmic coma or convulsions have supervened, or the patient has already advanced to the brink of dissolution. All of these strictly medical measures can be tested within a few hours; and, until those few hours have passed, so serious a procedure as a major operation should not be considered lightly. It matters little what type of acute diffuse renal inflammation is under consideration as regards the invariable observance of this rule of conservation and prudence. Instances of acute nephritis that follow exposure to cold, wet, and exhaustion, and those that appear to depend equally upon the influence of alcohol and some latent disability, or upon a bacterial infection that finds in the severe exposure its opportunity to gain headway, all follow the same general rules of treatment and cure. Many irritants, such as turpentine and

potassium chlorate, seem to exert an especially unfortunate influence upon the renal tissues.

The acute nephritis associated with severe burns, and the true nephritis occasionally associated with the pregnant state, call for the same handling as has been outlined above, and seem to respond to the same intelligent management, if response is possible in the nature of the case. Absolute rest in bed, a liquid diet, following a daily regular, gentle cleansing of the entire digestive tract from the mouth to the rectum, scrupulous cleansing of the skin, sweating, hot alkaline enemata, cupping, bleeding, spinal puncture,—these form the measures that may usually be counted upon to do certain good and no harm.

There is a possible temptation and tendency to curtail the oversight of acutely involved kidneys and to release the patient from the restraint of the bed and of dietetic regulations before the renal parenchyma is capable of resuming its functions. There are no organs more essential to the life of the patient and there are none that tolerate such a dangerous experiment with a greater certainty that, unless given full opportunity to reëstablish themselves at first hand, they will never cease to be objects and organs of concern. Many months of care and observation and judicious feeling of the way may be demanded before the glomeruli and tubules can resume functions that they have been compelled through violence to lay aside. In the treatment of acute nephritis, once the condition is clearly recognized, we are in certain respects far in advance of the stage arrived at by our fathers. We have the advantage of knowing a little more clearly the relation between certain toxic states and their resulting renal conditions. We also enjoy better facilities for both the home and hospital care of the sick. But our principles of treatment of acute renal embarrassments are in great measure the same, and our results in terms of cure are, I venture to say, not very different.

CHRONIC NEPHRITIS

The treatment of chronic nephritis has gradually resolved itself into something other than a misguided attempt to replace destroyed kidney tissue, or to resurrect an ability to functionate in an organ which no longer possesses the structural qualifications for the performance of duty.

Studied with the kidneys of the so-called chronic parenchymatous and interstitial nephritis on the table before us, and with sections of the same under the microscope, we realize at once that we are dealing with conditions that should have been prevented, and are now incurable. We are concerned with definite and permanent results of destructive processes which might once have been stayed or altogether forestalled. Thus the sclerosis that has scarred and deformed a normal into a contracted granular kidney, and stripped its tubules once for all of their epithelial equipment, is the ground condition that marks the misnamed nephritis, when finally recognized, as already years old. There is as little possibility of rehabilitating such a crippled mechanism as of restoring the abilities and capabilities of the posterior ganglia and columns in tabes. Indeed, the pathologic processes in tabes are of a similar character, and the treatment to which the physician must resort is very like in kind. In tabes other organs must be induced to substitute for the nervous centres, and the muscles at the periphery must be educated to take up new responsibilities and a new work. So when the power of functioning is, in small or large measure, lost to the kidneys, their duties of excretion, selection, and elimination must be shouldered—in just that measure vicariously—by the heart, the bowel, the skin, helped a little by the hygienic direction of the physician. Fortunately or unfortunately, a large portion of the kidney structure can be dispensed with before these organs begin to manifest their insufficiency through clinical signs. Owing to this fact, and because of the ability of the other organs to lend a hand, as it were, nephritic mankind is oftentimes enabled, like the tabetic, to stumble along for a time fairly comfortably with surprisingly little capable kidney substance at his command. In a word, the treatment of chronic nephritis includes very little in the way of handling of the kidneys as such. The kidneys of chronic nephritis might almost as well not be in their places. They are practically past using. This is far from saying that there are no definite measures that will, in many cases, yield gratifying results. Especially in instances of sclerotic kidney, it will depend largely upon the guiding influence of the physician and the intelligent obedience of the patient whether the latter lives two or three years or fifteen or twenty. He may even be led into an old age, and die of some ailment that has very little relation to his renal disease. I have seen more than one example of this occurrence. I well remember one of the professors

of my undergraduate student days telling his class of a patient who had heard from him with long and serious mien the verdict that had consigned him to an early death, not farther distant than the succeeding second year. This patient had insisted on having the gloomy prognosis in writing! "And," said the professor, "somewhat to my chagrin he has for fifteen years been exhibiting his death certificate to his friends and neighbors as something of a joke on me."

The wider the opportunity one enjoys to study nephritis, both from the clinical and the laboratory aspects, the more readily he divides the cases, at least from the standpoint of the treatment, into two sharply-defined categories, one consisting of patients that can live long and comfortably, provided they follow a carefully prescribed regimen, the other including cases which, in the face of every effort, run their course rapidly and progressively to a fatal close.

The sclerotic chronic processes of the kidney form the bulk of our nephritides. Let us, for the sake of thoroughness, however, consider first, and very briefly, the handling of the second type, the so-called parenchymatous involvement.

We have already stated that there occurs no instance of purely parenchymatous or exclusively interstitial tissue change. The kidney that presents a parenchymatous inflammatory process, that has advanced beyond the earliest acute stage, is already involved in and by a certain degree of interstitial implication. Similarly, the framework of the kidney, the intertubular structure, is never attacked alone. The glomerular and tubular epithelium participates to some degree in the consequences, if not in the actual stress, of the inflammatory storm. Clinically, however, there is no resemblance. From the standpoint of treatment, the two processes might as well have no microscopic features in common. And because of this clinical and therapeutic cleavage it will repay the effort to review the methods in vogue for the treatment of the various clinical types, and from these to construct, if possible, a sane working outline of the rational treatment of renal disease.

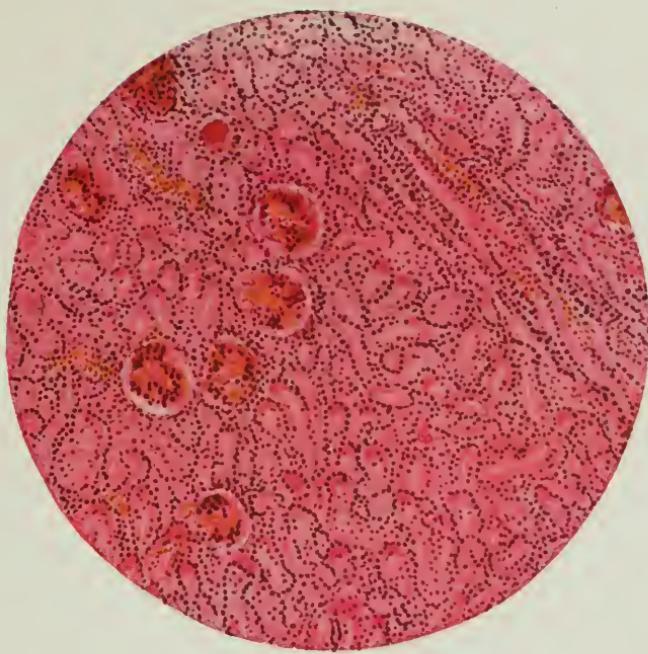
CHRONIC PARENCHYMATOUS NEPHRITIS

In this type the kidney functions are more or less completely set aside in proportion to the amount of damage suffered by the glomerular and tubular epithelium. The poisons ordinarily excreted by

the kidney are now retained in the body. As a consequence, every tissue in the individual is influenced, including the heart muscle, the vessel walls, and the central nervous system. Every red blood-corpuscle carries, and the blood-plasma contains, a certain quantity of non-protein nitrogen. As a consequence, the character of the blood and the ability of the heart to furnish the kidneys and the other organs with a proper supply of oxygen and other nutriment are both impaired. Thus is established a vicious circle that promises a progressively destructive change in the organs originally the seat of disease. First the degeneration of the epithelium, then the poisoning of the vital centres and tissues (including the blood), further impoverishment of the kidney structure owing to poor blood-supply, then another wave of destruction of the renal epithelium, until the organ is no longer capable of functioning! (Fig. 4.) Death usually ensues within two or three years, often much sooner. Rarely a patient recovers. We have before us, then, a problem involving the prolonging rather than the saving of life. If a drug like tobacco or alcohol, mercury or salvarsan, has been the active factor in producing the condition, our first step must, of course, be the complete withdrawal of the cause. Few physicians and fewer patients realize how long the store of a given drug already within the normal human economy remains before its final disappearance by excretion. With the kidneys out of commission probably there is only a very slow and very slight reduction in the quantity day by day. There may be none. Both mercury and salvarsan are selective poisons for the epithelium of the convoluted tubules. There are forms, however, of syphilitic nephritis in which active antisyphilitic treatment with these drugs is the only means of curing the nephritis. In such a case it is a simple question of choosing the lesser of two evils, and of balancing the influence of the drug poison against the toxin of the much more dangerous and destructive spirochaete.

We must not allow ourselves to forget the intimate dependence of the kidney for its power to functionate upon the integrity of the nervous system. Jungmann (*Münch. med. Woch.*, August 12, 1913) has recently shown that either a puncture of the fascicle of nerve-fibres to the side of the mesial sulcus and beneath the floor of the fourth ventricle, or a severing of the splanchnic nerve, causes polyuria and an excessive output of sodium chloride. Meyer of Strasburg had pre-

FIG. 4.



Chronic parenchymatous nephritis.

FIG. 5.



Chronic interstitial nephritis: note the excessive fibrous tissue.

viously shown the influence of the spinal cord upon renal function, claiming that increased quantity of urine and overexcretion of chlorides are due, on the one hand, to irritation of the vasodilators, and, on the other, to a direct excitation of the renal epithelium. We have in the nervous system, then, still another factor to be weighed when outlining the treatment of the given case of nephritis. Owing to the presence of certain toxins in the body and their damaging influence upon the heart and upon the blood-vessel walls, as well as upon the character of the blood itself, there is usually in parenchymatous nephritis a widespread œdema which may not confine itself to the superficial tissues, but may tend more and more, as the tension falls in the circulatory system, to involve the serous cavities of the pleura and peritoneum, also the ventricles of the brain and of the spinal cord. It is very improbable that the kidney itself has any potent influence in the causation of the profuse œdema of parenchymatous nephritis. In its failure to excrete the toxins manufactured elsewhere in the body it simply permits the causal factors to become operative. The failure of the cardiac muscle explains only in a small measure the infiltration of the tissues throughout the body. The elimination of the toxins, therefore, furnishes a third problem in the treatment of the disease. This can be accomplished only to a very limited extent through the skin. Tachau (*Deutsch. Arch. f. klin. Med.*, 1912, cvii, 305) has calculated quantitatively the amount of nitrogen and sodium chloride in the sweat of a number of cases of nephritis, the bath continuing one hour, and the total amount of sweat being collected. He found the excretion of nitrogen was inappreciable (averaging 0.25 gramme or less); but the sodium chloride excretion, especially in the presence of marked œdema, was considerable (1.3–2.05 grammes).

On this basis, and with the definite conviction that the œdema itself is due to the retention of toxic products which the sweat-bath does not eliminate through the skin, it is hardly likely that the hot-pack and the steam-bath will be employed in future to the extent they have been by their devotees in the past. In view of our inability to utilize the skin to any great extent in the elimination of the nitrogen products, we will in many instances employ the bowel. Reference will later be made to this invaluable substitute outlet.

With these preliminary considerations before us, we are ready to outline the treatment of the patient whom we know we cannot save,

except in a rare occasional case, which seems, in spite of all likelihood to the contrary, to contradict the rule, and, as the result of his own inherent qualities rather than as the result of treatment, to recover.

REST

So far as possible the patient should be placed at complete bodily rest. This method requires the bed, of course, as all other forms of rest are but a makeshift. Moreover, the bed should be both sanitary and comfortable. Whether he should remain constantly in it or only for a portion of the day is, in most instances, determined by the prostration of the patient. The sleeping- and living-rooms should be flooded with fresh air, of a temperature agreeable to the patient. During the periods of improvement he may be encouraged by brief periods in the chair, or even by being allowed to walk a few steps. He will soon realize, however, that his only comfortable hours are in the bed, and will fall naturally into the practice of spending his entire time in a reclining position.

THE DIETARY

The dietary should be nourishing, but extremely simple, a sufficient number of calories being provided to maintain the body so far as possible against the progressive wasting and exhaustion. Rich foods and those calculated to irritate rather than to nourish the kidney structures should, of course, not be ventured. But a strict milk diet is neither wise nor necessary. The amount of solids eliminated in the urine on an exclusive milk diet is as large as on a fibre or meat régime, while not nearly the amount of nourishment or satisfaction is obtained, the latter being almost of equal value with the nourishment. Fats and carbohydrates seem to make less severe demands upon the renal tissues than the proteids, and the carbohydrates less than the fats. Yet I can recall more than one patient in whose brief career an occasional fairly generous mixed meal, with a small portion of meat or fish, made him radiant and hopeful and acted as the stimulus and beginning of a period of improvement. In cases in which headache, gastro-intestinal irritability, and drowsiness are prominent features, the best results will be obtained by limiting the patient strictly to the carbohydrates. It is well to remember that the blood-pressure can be modified considerably through the regulation of the food character and supply, and that, while not advisable to aim at attaining a normal

pressure in cases in which it tends to be high, none the less it should not be allowed to become excessive.

Few students of the dietary of nephritis persist in the feeling that a salt-free diet is advisable, except in cases in which the restriction of sodium chloride manifestly controls the œdema, as it occasionally does. Many patients are not influenced by its withdrawal. In such the anasarca is most actively influenced, if at all, by a complete withholding of the proteids from the diet. Cooked eggs often seem to be fairly well borne. Salads, fruits, vegetables, and bread will furnish a fairly generous programme; but great caution should be used against overfeeding the patient, for cardiac failure and uræmia will be the spectres hovering near the moment an excess of food is introduced into the alimentary canal. In no condition is it so true as in parenchymatous nephritis that the digestive capacity of the individual patient must be tested and then supplied according to its own particular need. Enough food for one individual may be too much in another case seemingly identical. The tendency to undernourishment, anaemia, and final emaciation must be borne ever in mind, so that the "enough" limits may be set at a point both considerate and judicious.

With regard to drinking water, I am inclined to believe, from my own experience with many cases, that more often an ample supply does good rather than harm. Again, it is a simple matter to test its effect upon the œdema and upon the general condition. Certainly, a definite amount is necessary to supply the body needs and to flush the overloaded kidneys. Moreover, uræmia seems far less frequent, so long as the patient enjoys a full water supply. Too much water adds to a burden already greater than the kidneys can bear.

Alcohol and tobacco should be completely withdrawn in all cases in which there is desired as extensive as possible a postponement of the end.

MEDICINAL TREATMENT

Apart from a symptomatic treatment, aimed at the control of the inevitable anaemia and cardiac asthenia, medicines will have only a little part to play in the handling of the case. Alkalies, especially in the form of the alkaline waters, often seem grateful to the patient and of benefit to his kidneys. The intestinal tract should be swept clear, at least once weekly, the best means being some palatable prep-

aration of castor oil. When this is poorly borne, one of the salines given in lemonade will prove effective and satisfactory. Not infrequently by this means a considerable portion of the tendency to intestinal indigestion and ulceration can be avoided. Iron preparations, especially the tincture of the chloride of iron, used for short periods at various stages in the disease, may exert a beneficial influence. One of the newest and most gratifying suggestions has been that of the use of thyroid extract in parenchymatous nephritis. J. F. Percy (*Journal American Medical Association*, Nov. 9, 1912, and Aug. 9, 1913) seems to have demonstrated at least a definite amelioration of the symptoms as the result of the use of this organic medicament. He advises the average administration of six two-grain tablets during the twenty-four hours, gradually increasing this dosage after a week's time, and cites a number of cases from which both the cardiac and renal symptoms, as well as the large albumin content of the urine, were caused to lessen, and in some instances even to disappear. He believes that its influence is largely upon the "metabolic processes of nutrition, especially with reference to proteins." The natural comment would be that, while we cannot expect by means of a drug to replace destroyed and essential renal epithelium, none the less if these claims are substantiated we shall welcome the first real medicamental lightening of the distress of this disease. One other measure should be mentioned in connection with drug therapy. Oftentimes the slow administration of a hot normal solution of sodium bicarbonate by the rectum will exert a most beneficial and grateful effect, inducing sleep, and giving rest to the weary nervous tissues that oftentimes seem hardly able to withstand the influence of the toxins circulating in the fluids of the body. Given once daily, and preferably toward bedtime, such an enema will often turn a restless night into one that will shed its benefits over the entire next day.

Syphilitic nephritis calls for the judicious use of mercury and the iodides. Salvarsan and neosalvarsan should be withheld until all other means of control have failed. Except in the syphilitic form of nephritis, mercury, and especially calomel, will prove dangerous instruments. I remember two instances of calomel poisoning from small doses in nephritis, one resulting in uræmic aphasia, and the other in coma and death. When used at all, probably the blue mass is the safest form of mercury for administration. However given, the

drug should be hastened in its passage through the intestinal tube by a saline. I know of no positive indication for its use, and am convinced that in nephritis mercury had better be omitted from the drug list.

HYDROTHERAPY

Warm baths, especially in the form of oxygenated water—also the carbonated Nauheim baths—may prove of positive benefit. Even in cases that exhibit hypertension, very frequently the heart and kidneys will both obtain advantage from a not too prolonged application of a medicated bath at a temperature ranging from 100° to 110° Fahrenheit. A bath of even two or three minutes in the beginning may gradually be lengthened to ten, fifteen, and twenty minutes, if agreeable to the patient, and if found helpful. If distressing it should not be repeated, and at the first sign of cyanosis or dyspnoea the patient should be removed to bed. If possible, a portable tub should be used beside the bed. Free sweating usually follows such a bath, with relief from many of the nervous symptoms and much of the cardial distress.

The ingestion of plain and alkaline waters, and the administration of alkaline solutions by the bowel, have already been discussed.

CHRONIC INTERSTITIAL NEPHRITIS

There is one time, and only one, in which renal sclerosis can be cured,—namely, before it has occurred. There is also only one method by which chronic interstitial nephritis can be confidently treated,—namely, by prevention. If the ground conditions that lead up to and develop into renal sclerosis can be recognized and dealt with early, the physician will in this one step exercise a skill and cunning far less brilliant and remunerative, to be sure, but far more productive in terms of the salvage of human life, than by any other medical or surgical accomplishment. Patients die of arteriosclerosis, and of apoplexy, and angina pectoris, and cirrhosis of the liver, and kindred ills; but every one of these patients dies also of sclerosis of the kidney; and, perhaps, if the latter were not present, they would not die when they do.

There is one fortunate feature of the case. In sclerotic kidney the destruction of the parenchyma by the ever-contracting fibrous tissue is counteracted to a certain extent and for a time by the com-

pensatory hyperplasia and hypertrophy of that portion of the epithelial structure which remains intact and capable of functioning (Fig. 5). Thus, for a time, seriously involved kidneys may appear to do their full amount of work and in a fairly normal manner. Cardiac hypertrophy soon supervenes and assists in masking the hidden insufficiency.

Whether it is true or not that there are three distinct types of sclerotic kidney is not of serious importance with reference to treatment. It has been customary to describe a primary renal sclerosis to which a sclerotic involvement of the circulatory system may be secondary (the result of toxins and hypertension); next, a secondary renal sclerosis in which arteriofibrosis is the underlying and causal factor; and, finally, the independent sclerotic involvement of the vessels and of the kidneys, without reference to one another. With respect to the preventive treatment this classification is only important in directing attention to the fact that in all three types the circulatory system, especially the blood-vessels (arteries and veins), is involved. There is also, perhaps, a suggestion of help in the similarity of causal conditions that must be prevented. The infantile form of sclerotic kidney is an inherited condition, frequently begun *in utero* and not seldom the result of congenital syphilis. The radial and brachial vessels of these little old men and women infants are usually hard and leathery fibrous cords rather than elastic, distensible tubes. No treatment can save these children, and death soon asserts its claim. Oftentimes it is difficult to prove the parent syphilitic. Born healthy and well, however, and free from specific taint, no individual under intelligent guidance need acquire chronic interstitial nephritis. A perfect hygiene of mind and body will insure soft vessels and a competent heart and useful kidneys into old age. The perfect mental and moral and physical hygiene of which we speak will include, first of all, perfect cleanliness, the right kind and amount of food, plenty of water to drink, sufficient exercise to burn up the last atom of ingested food, a daily emptying of the intestinal tract, a full quota of rest and sleep, neither too much work nor worry in childhood or in adult life, freedom from alcohol and tobacco. The nearer we attain to this stage of perfect equipment, the more certainly we shall escape the possibility of developing fibrous arteries and sclerotic renal disease in whichever order they come. We all eat too much, few individuals understand the hygiene of the bowel, and men and women of

to-day are forgetting the little they ever knew concerning the principle that there is nothing to gain and everything to lose in haste and worry. The physician, in his study of a given patient, who may consult him for some simple ailment years before arterial or renal damage is under way, has the advantage of several signboards indicating this trend. One of these is the patient's own disposition. He may show in his speech, in his walk, in every gesture that he is of the hurrying, worrying kind. But he may be taught to masticate properly, to think and talk and eat moderately, even to take one step where heretofore two have been taken. His pulse and the tension of his vessels are the best of all telltales. A constant systolic pressure of over 140 mm. in young or old of average physical habit is always indicative of the need of care. Such considerations, of course, require more attention on the part of the physician than the all too frequent inspection of the tongue and the immediate issuing of a prescription. Once hypertension is even suspected, the whole gamut of inquiries concerning the personal hygiene of the patient should be run, and his or her intelligent co-operation secured after a full explanation of the object at which the physician aims. Medicines will play a minimal part in the prevention of sclerotic disease of the kidney or any other organ. A saving of heart-beats, of energy, and of mountains of worry will add enjoyment and years to a sanely busy life.

Once recognized as present in extreme or mild degree, sclerosis of the kidneys calls, first of all, for the same hygienic régime that would have been prescribed were we trying only to prevent its oncoming. We now have a damaged renal mechanism, a hypertrophied, (and the beginning of a) dilated heart, and hypertension in sclerotic vessels in every tissue and organ of the body. We must remember that in all likelihood the process that has been going on in the kidneys has involved the stomach, intestines, lung, liver, and spleen. All are in some stage of fibrosis, and to that extent unable to fully perform their functions—at least when called upon in an emergency to do extra duty. Our aim must be, therefore, so far as possible, to remove the cause of the kidney disability, to lighten the load of these vital organs, and by a hygienic manner of living to enable the patient to favor them in every way. The dangers that threaten are (1) myocardial degeneration, and consequently cardiac dilatation and failure, (2) uræmia, (3) apoplexy, and (4) angina pectoris. It may be that

one or all of these can be prevented, and the attempt is well worth while. Often many years may be added to the life of a patient with chronic interstitial nephritis, provided he will live according to a hygienic régime. Among the causes of the disease are repeated attacks of acute nephritis, a long-continued excess of food, arteriosclerosis and all its etiologic features, the acute toxins of gout, diabetes, and syphilis, continued (moderate and immoderate) use of alcohol, tobacco, mercury, and lead poisoning. Some of these influences we can set aside. Some, like arteriosclerosis and perhaps syphilis, are permanent and constant factors, and must be reckoned with specifically to the end. An excessive indulgence in food implies an intestinal toxæmia that need not and should not be allowed to continue. Its correction will not only remove an active causative, toxic factor, but will secure for the kidney structures an all-important rest.

Rest will be absolutely necessary in the beginning of treatment for the patient's mind and body. By rest is not implied confinement in bed, or even the chair. Rather it means relaxation from the tension in which the life of the patient has usually been spent. Usually it means ceasing all work for a time, and, on resuming, attempting only that which is found not to test lame organs beyond their ability.

The urine may show considerable evidence that will prove of service in determining the course of treatment, or may indicate next to nothing. Its quantity, its specific gravity, its albumin content, its microscopic findings, its chemical analysis will all have their significance. The hypertension in the circulatory system, and the presence or absence of anæmia, will indicate the influence or absence of toxins circulating in the blood, and the need of special aid in their elimination. Rest to the heart, rest to the digestive tract, rest to the nervous system, will all mean physiologic and functional rest to the kidneys, much to be desired.

The dietary in chronic interstitial nephritis need not be a prison fare. Probably the nearer it comes to a vegetable régime, the more accurately it will conform to the ability of the digestive tract and the kidneys to assimilate and eliminate until only a harmless residue remains. An attempt should be made to determine just what can and what cannot be thoroughly assimilated, both as to the kind and quantity of food. The blood-pressure should be studied before and after meals, and at the beginning and end of the day. A certain moderate degree of hy-

pertension (140-160) in a strong, muscular man or woman should not be looked upon as excessive. While I do not believe that hypertension due to toxæmia (such as that of sclerotic kidney usually, if not always) can ever be regarded as beneficial, still it may be said just as truly that a falling or low blood-pressure in this condition is almost invariably due to a weakening or already deficient heart muscle.

Just as in the dietary suggested for parenchymatous nephritis, the proper nourishment of the patient is the desideratum. Toxæmia is the result to be avoided if possible. The patient who is heavy and sleepy immediately after meals has had too much food for his digestive ability, no matter how small the amount. Another patient will eat twice as heartily and digest all. Again, rich foods and substances liable to raise the arterial tension must be foregone. The proteids are the least necessary and valuable, the carbohydrates the most essential at this time. I have not found it necessary in most cases to withdraw meats from the diet. Even a healthy person, however, needs meat not oftener than once daily, and perhaps not so frequently. The sclerotic kidney naturally will not tolerate more than this allowance.

If the gastro-intestinal tract shows indications of irritability or even ulceration, the dietary must be restricted and especially chosen for the individual condition and patient. Eggs and milk will always be allowable, provided they are digested by the patient. Fresh fruits, and nearly all vegetables—except, perhaps, tomatoes and other highly acid varieties in gouty cases—will be suitable and helpful. Again, in sclerotic as well as parenchymatous nephritis alcohol and tobacco should be altogether withdrawn.

INTESTINAL HYGIENE

There is probably no other one measure so essential to the prolonging of life in these cases as a scrupulous gastro-intestinal house-keeping. From the care of the teeth to the daily evacuation of the bowel, the whole digestive tube should be a matter of special consideration. Probably there are made the toxins which cause hypertension. Their manufacture depends largely upon the retention and decomposition (rotting) of undigested food, kept for hours and even days mayhap, at summer heat, in a tube that can only with difficulty be rendered sanitary. A castor-oil cleansing once weekly and a star-

vation day to correspond will be of great benefit to these patients, as indeed they would to many well people. An abundance of water should be drunk during the 24 hours (not an excess) to insure the daily evacuation, and to replace the excessive amount of body fluids usually excreted by the glomeruli of sclerotic kidneys. Probably six glasses (a quart and a pint) daily will prove a fair average allowance, none being ingested after 5 p.m. If drinking water fails to insure a daily intestinal action, some simple laxative such as the fluidextract of cascara sagrada, used in small doses three times daily, rather than in one large portion at night, will act as a tonic and stimulant for the bowel.

HYDROTHERAPY

In spite of the fact that sodium chloride, in all its methods of application, tends to elevate the blood-pressure, occasional warm salt-baths may and often do have a very beneficial effect. The Nauheim baths are being used more and more widely in cases that appear to be benefited by their application. Pure oxygenated and sodium bicarbonate baths may also be found grateful to the patient, through furnishing a tonic influence to the terminal nerve filaments and the vasomotor system.

I have found most helpful in removing toxæmia and in warding off the uræmic state a steam cabinet, used at night by the bedside to produce free sweating. The bath should at first consist of only a few (3-5) minutes of sweating. This can be gradually lengthened out to ten and fifteen minutes, as the benefits begin to appear. It can at first be employed once or twice a week, and later may even be pressed into service at each bedtime.

Rectal enemata of a hot solution of bicarbonate of soda or of sodium chloride, slowly given, will often flush out an embarrassed renal apparatus and clear away an impending uræmia as nothing else will do, save a lumbar puncture and evacuation of the spinal fluid, or a free housecleaning with castor oil.

MEDICINAL TREATMENT

All habit drugs, including alcohol and tobacco, should be completely withdrawn. The only drugs that are likely to prove beneficial to the case will be the tonic preparation of iron and the vasodilators

(except the iodides), including thyroid extract, which, in spite of its iodine content, seems to exercise a beneficial influence upon both the kidney and the heart and the blood-vessels. Nitroglycerin (so long as the heart muscle is competent), aconite, veratrum viride, are all useful drugs. Occasionally digitalis can be used in combination with these for its cardiac and diuretic action.

The alkaline drinking waters will often be grateful to and frequently beneficial to the patient with renal sclerosis. Both by the mouth and bowel occasional neutralization or alkalinization of the urine will seemingly counteract the toxæmia that is ever signalling for recognition. The action of the toxins of nephritis is similar to that of suprarenal extract,—raising blood-pressure, and at first stimulating and then poisoning and weakening the cardiac muscle. The occasional bleeding of a sthenic patient, evacuation of the spinal fluid when the vascular tension is high, both preceded by free catharsis, will sweep out the toxins from the body and lower the circulatory and intracerebral and intraspinal pressure as no other measures or medicaments will do.

The foregoing will constitute the general outline of the treatment of renal sclerosis. It will be observed that our objects are two: First, to stop further fibrous change in the kidneys; and, secondly, to prevent the formation and accumulation of nitrogenous waste materials and toxins in the body. By these simple means the patient may be safely guided for many years, so as perhaps even to reach old age, and to die of some condition other than active renal disability.

URÆMIA

The treatment of uremia, so frequently an incident as well as the terminal phase of nephritis, especially of the sclerotic type, has been omitted until now in order to deal with it as a symptom-complex almost independent of the renal disease. We neither understand the exact nature of nor the organs primarily at fault in uremia. The liver and kidneys are both apparently implicated to the extent of refusing to perform their eliminative functions, and possibly the ductless glands have some influence in causing the symptoms. The condition apparently consists of a toxæmia dependent upon the circulation of some poison or poisons of the nature of adrenalin, both in their early stimulant action and in their rapid secondary toxic

and paralyzant influence. The nervous centres are profoundly influenced, and destructive changes (macroscopic and microscopic) have been frequently demonstrated in the brain and spinal cord. The vasomotor system of nerves is overstimulated to the point of causing excessive intravascular tension so long as the cardiac muscle withstands the influence of the toxin upon its nervous supply and upon its muscle-fibres. When it yields, the blood-pressure falls and the uræmic picture changes from one of hypertension to cardiac insufficiency, vasomotor paralysis, intravascular hypotension, and profound asthenia.

Thus there are two types of uræmia calling for treatment. The first is pictured in a patient with a heart still capable, in spite of a deep toxæmia, a full bounding pulse, a fairly high temperature, usually delirium or coma more or less profound, and a mixed degree of vascular hypertension (160-200 and above). Uræmic hemiplegia or monoplegia, aphasia, or a cerebral bleeding in the course of the uræmia, all are frequent phenomena. These hypertension or sthenic cases of uræmia often respond favorably to treatment and recover sufficiently to seem perfectly well. They may experience several severe attacks before the final one which closes the scene.

The second type may be recognized in a uræmic patient with a dilated weak heart, a rapid running pulse, a low (often subnormal) temperature, and a cold, clammy skin. The intravascular tension is low. The prognosis in such cases is almost uniformly bad, and the only possibility rests in the restoring of cardiac compensation and the lost vasomotor tone. Sometimes the asthenic type of uræmia succeeds the hypertension form. Usually it forms a picture by itself, and from the outset offers no hope of alleviation or cure. These cases usually die slowly from sheer exhaustion of the nervous centres. The terminal phenomenon is frequently Cheyne-Stokes respiration, in deep coma.

The treatment of these two types is as different as the clinical pictures. The *febrile, sthenic uræmia* with hypertension calls at once for the lowering of intravascular pressure. This may best be accomplished in one of three ways: (1) By purging, (2) by free bleeding, and (3) by spinal puncture. By purging we mean not simply the emptying of the sigmoid flexure and rectum, but a thorough cleansing of the intestinal tube. Salines given in small, frequent (half-hourly)

doses of concentrated solution will prove the most effective means of accomplishing this end. Bleeding should be measured rather by the effect upon the circulation than by the amount of blood removed. Usually not less than a pint, and more often a quart, will flow before the tension is effectually reduced. Through spinal puncture every drop of spinal fluid should be slowly removed. The procedure will often need to be repeated, perhaps more than once. The canal refills promptly from the ventricles of the brain, and does not cease refilling until the circulatory hypertension is relieved. I have frequently seen a uræmic coma or hemiplegia, or both, relieved very shortly after spinal puncture. On more than one occasion the patient has given evidence of power in a paralyzed member before the fluid has ceased flowing. There is no more certain method of relieving the epileptiform convulsions of uræmic hypertension and pressure.

Sweating in these cases does good if secured by means of pilocarpine or some similar measure, such as hot lemonade or other hot drink. I have gradually had forced on me the belief that the sweating obtained through the hot-pack or the steam-bath does not compensate for the increase of tension caused by these procedures. Even diaphoretics should be avoided when the skin is hot and devoid of moisture. Nitroglycerin, sodium nitrite, and potassium nitrate may all be employed so long as the heart is strong. Their action in dilating the vessels will aid greatly in removing peripheral resistance in the circulation. Aconite in full doses is a still more effective vasodilator, but requires special attention to the patient on the part of the nurse. It is an almost perfect physiologic offset for the adrenalin-like toxins circulating in the tissues, and is the ideal antidote up to the point of contra-indication on the score of cardiac distress. When the signal comes to stop its use there must be no delay, or all the good the drug has accomplished will be buried in the grave.

Hot normal sodium bicarbonate solutions in the form of enemata have seemed to me extremely beneficial in uræmic cases, not only in providing diuresis and flushing of the kidneys, but in controlling the effects of the uræmic toxins upon the central nervous system. Given very slowly, by the drop method, a considerable amount of alkaline solution will be absorbed during the hours of the day. The night hours should be reserved for complete rest. Morphia can be used to

control delirium, convulsions, and restlessness, and to promote sleep, which is essential if the patient is to recover. Like aconite, morphia seems to exert a natural antidotal action against the active toxins at work in the body. I never use opium in any form in a case of nephritis, however, without recalling a patient with erythema multiforme, studied during my experience as a hospital interne. She was swathed in bandages wet with lead-water and laudanum solution, and as a result, I was summoned to her bedside in the early hours of the morning to find her respiration 4 to 6 per minute, and to record her death a little later. She had been recognized as a case of nephritis, but no one had apprehended such a ready absorption of and sensitiveness to the drug.

Very seldom has morphine been found necessary in my experience, however, after the intravascular and intracerebral tension has been lowered by the means already suggested. Usually quiet sleep has followed promptly without the use of drugs. Food should be altogether withheld during the active uræmic symptoms, and at least until the bowel has been swept clean. The appetite asserts itself once the toxæmia is relieved, and until that time the foodstuffs that might be introduced into the stomach and intestine would only furnish a new supply of material for the manufacture of toxin.

The asthenic or low-tension type of uræmia calls for an entirely different handling. The temperature is low (often subnormal), the heart is weak, and all the vital forces are reduced to a minimum. Bleeding, purging, and spinal puncture will kill the patient. Cardiac depressant and vasodilator drugs exercise a similar influence. The hot-pack may now become a life-saving institution, and hot normal salt solution introduced into the bowel will stimulate the vital forces and assist in raising the tone of the circulatory system.

Cardiac stimulants (neither alcohol nor nitroglycerin, which are both cardiac depressants), especially atropine in combination with digitalis, caffein, and spartein (the latter in one-quarter and one-half grain doses), may energize the weak heart muscle to the point of restoring compensation at least partially. The outlook in these asthenic cases is, however, not good, and too much should not be expected from even a prompt and intelligent treatment. The foregoing has had reference only to the so-called acute uræmic attack.

CHRONIC URÆMIA

There is also present not infrequently in cases of chronic interstitial nephritis a condition perhaps best described as chronic uræmia, or chronic uræmic toxæmia. In such individuals there is absorbed almost constantly just enough of an excess of toxin to produce symptoms. Marked drowsiness after meals, a decided increase in an already high intravascular tension following either the ingestion of food or the most moderate exercise, grumbling headache, frequently a tendency to flushing of the face, and oftentimes numbness and tingling with motor embarrassment of some member (arm or leg) or even of one-half of the body—these are the signs, one or all of which may indicate that the patient is walking along the edge of the precipice leading to an acute uræmic attack. They may continue indefinitely, or they may usher in with slight warning an attack of coma, a hemiplegia, or a convulsive seizure.

Chronic uræmia, once recognized, calls for prompt and systematic treatment along the lines indicated in the discussion of chronic interstitial nephritis. Especially must the food supply be scrutinized, both in the matter of quantity and kind. Probably a safe experiment will consist in the use of a strict carbohydrate dietary for the time. Intravascular tension should be brought to an approximation of the normal range that will rid the patient of untoward symptoms by any or all the measures we have suggested. An occasional spinal puncture will prove one of the most gratifying measures in terms of the response of the patient to the relief from intracranial and intraspinal pressure.

Under these circumstances it is also advisable to place the patient in bed for a few days. He can then be started forward anew, with the disappearance of the evident signs of toxæmia. Complete rest is not only beneficial to the kidneys, but to heart, liver, gastro-intestinal tract, and the nervous system. I have been accustomed in private practice to encourage a patient with chronic uræmia, providing the intravascular tension is not so high as to contra-indicate the procedure, to indulge at intervals in a Turkish bath once weekly for several weeks. Even more effective has been the stimulation of all the excretory tissues of the body, especially the skin, in the hot-air or steam cabinet, which can be used for five to fifteen minutes at the bedside.

before retiring. No two patients will gain the same benefit from identical measures. Some of those mentioned will, however, be found to suit every individual case. The object is not, after all, to see how much we can do for a given patient, but to determine exactly which one or two measures will produce the desired result.

In the foregoing discussion of the treatment of nephritis I have not attempted to repeat every suggestion made from every quarter. I have not dealt with cardiorenal disease as such, nor with the kidney of pregnancy, though the general lines of treatment of both of these conditions have been amply covered in my general discussion. I have simply tried to offer in a concise and useful way measures and means that have served me personally in the handling of true nephritis in the hospital and without.

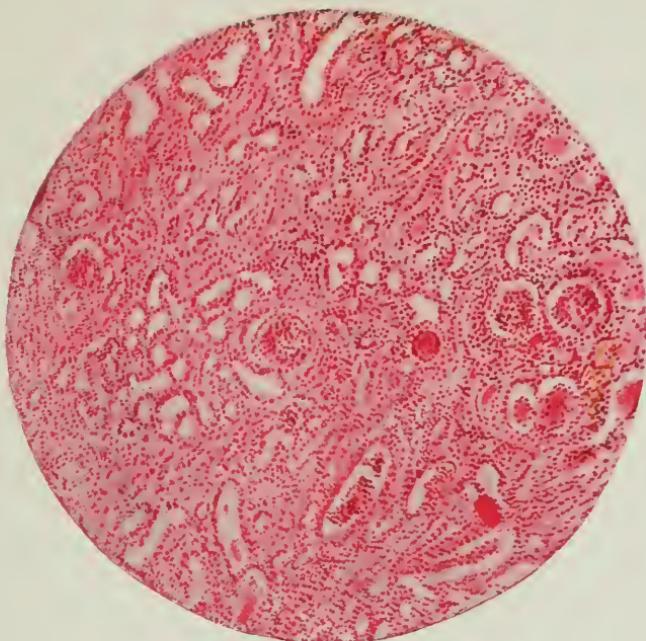
I have not mentioned serotherapy, even though Dominguez (*Rev. de Med. y Cirugia*, Havana, Dec. 25, 1912) states that Teissier's method of injecting the serum from the renal vein of the goat subcutaneously "has passed beyond the experimental stage." Teissier's original claim (*Bull. de l'Acad. de Med.*, Oct. 6, 1908) was simply that the venous blood issuing from a glandular organ must contain the internal secretion of that organ in quantity. He attributes its efficiency to its action upon the liver and other glands.

Nor have I mentioned the renal lavage that has been so highly endorsed in certain cases of pyelonephritis.

Among surgical measures, passing reference has been made to the temporary advantage, often well worth while, gained from capsule-splitting and from decapsulation with omental investment. The object of the latter procedure is, of course, the establishment of a new and more ample blood-supply to the kidney. Probably Dunn's report (*Journal American Medical Association*, Feb. 17, 1912) of a case of anuria of 114 hours' duration in acute congestive nephritis is the most striking example of the benefit occasionally to be derived from decapsulation of both kidneys (Figs. 6 and 7). Urination commenced four hours subsequent to the operation, and 173 ounces were passed during the first 24 hours. No anaesthetic was used, the patient being in a deep coma.*

* The patient had been catheterized. The blood-pressure was 180 mm.

FIG. 6.



Acute hemorrhagic nephritis.

FIG. 7.



Glomerular nephritis with hemorrhages in and into the Malpighian tufts.

I have intentionally dwelt very lightly upon drug treatment, because medicinal measures form the least important element in the treatment. It is well to remember, in this day of hydriodic acid and so many other iodine preparations, that all of the iodine derivatives are irritating to the kidney tissues and very difficult for them to eliminate, even when in a healthy state.

I have omitted up to now the suggestion of a possible substitution of one kidney from a healthy man for the useless kidney in another, or even the substitution of the kidney from a recently dead cadaver. This experiment has repeatedly been tried in healthy animals with healthy substituted kidneys, and with altogether successful outcome. An exchange has been made, as is well known, of the kidneys of animals of different species (cat and dog). In communicating with Carrel, of the Rockefeller Institute, with a view to an actual attempt of a similar kind upon an otherwise hopeless patient of my own, I found that even such an intrepid experimentalist did not feel justified in trying out the theory upon a man or woman in whom the new sound kidney must act in association and under the influence of a diseased organ on the other side. The probabilities seemed too likely of a prompt parenchymatous degeneration of the grafted kidney.

Isobe (*Mitteil. a. d. Grenzgeb. Med. u. Chir.*, xxvi, 1913) has shown by experimental study that when one kidney is diseased the epithelium of its healthy mate suffers in the elimination either of the diseased kidney's product or of the toxins which it should and does not excrete. It is my own thought, however, that when a patient can be found with absolutely no prospect other than that of the speedy death of a nephritic, and one willing to venture the experiment of having two healthy kidneys substituted for his own diseased organs, barely enough of an interval being left before the transplanting of the second organ for the first substitute to begin to functionate,—that then the likelihood of degeneration will be reduced to a minimum, and we may at last be able to speak of a real cure for nephritis. In any event, the object is worthy of the attaining. Those who have helplessly watched many nephritics die, as one is compelled to every year in a large public hospital, realize what a godsend to humanity such a cure would be. Unless some other investigator precedes me in this field I shall look forward with keen interest to a future report upon animal experiments of this nature, and who knows but that we

may find the conditions all favorable to an advance in the form of a similar study upon some willing and eager human being who would prefer to die unless the chancery be afforded to live in a different state of health!

The whole subject of the treatment of nephritis may have to be dealt with in the near future in a new and very different manner. Our gradual enlightenment as to the accumulation of organic nitrogenous toxins (residual nitrogen) in the blood is forcing an entirely new understanding of the origin and causation of the various processes that play a part in the different types of nephritis. No method promises so much of hope to the nephritic, however, as that of furnishing an entirely new and healthy renal mechanism. May the day speedily come in which this old and crying need may be finally bridged over by the most brilliant surgical achievement of all time!

CARDIOVASCULAR-RENAL REGULATION BY OTHER MEANS THAN DRUGS

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I. CARDIOVASCULAR-RENAL disease is a useful term to include not only clinical entities wherein the three factors are pathologically related, but all states exhibiting morbid alterations of vascular tension, plus or minus.

Blood-pressure, when above the norm, constitutes a vascular reaction against the presence of toxins in the circulating fluids. Hence the primary consideration is to get rid of the toxins. When the pressure is abnormally low, reaction to toxic influences has gone too far for safety. Conservative measures to restore equilibrium are then indicated.

Common causal factors in vascular hypertension are too much or unsuitable food, along with too little exercise; in short, accumulations of self-formed poisons. Vascular equilibrium is obtained by regulation of conduct more efficiently and permanently than by the employment of any drugs.

Where vascular hypertension is present, there is also some enlargement of the heart. In hypotension there is present not so much cardiac weakness as failure of vasomotor centres. Cardiac insufficiency, if present, should be determined. Subjective symptoms must be judiciously estimated, not ignored. In all acute infections blood tension is lowered, except in meningitis. Slight cardiac dilatations should be early noted and their symptomatic relationships determined.

A large group of persons are, as Charles Lyman Greene points out, peculiarly lacking in heart-muscle tonus and possess exceptionally dilatable, symptom-producing hearts as characteristic of their make-up, an index of fundamental or congenital inferiority. He says:

“The term ‘perfect compensation’ is a misnomer, and the pathologic events in such cases make it evident that there is a constant, more or less gradual, but progressive, limitation of the field of cardiac

response, and periods must inevitably occur, long before the onset of emergent or gross symptoms, when appropriate therapeutic measures will aid the embarrassed and laboring heart, relieve suffering and prolong life."

Regulatory, conservative measures, suitable for hypertension, are much the same as for a case in which cardiovascular-renal disease has actually begun. One should be in no hurry to lower tension till causal factors are evaluated.

II. The major circulation is readily influenced by exogenous agencies—psychical, mechanical, and physical. Lymph-propulsion, a deliberate process, of almost equal importance, is similarly affected.

A view of cardiovascular-renal pathology from the standpoint of tissue-susceptibility to mechanical and psychic stimuli simplifies the solution of many therapeutic problems. A review of available literature shows that much is known which, when digested and systematized, will aid in settling many urgent clinical questions. Familiarity with vasotonic variations in apparently normal persons is necessary to a right appreciation of pressure anomalies in whom disease is beginning.

The earlier phenomena and pre-phenomena of cardiovascular disorders need most attention. Conclusions reached are to the effect that causal agencies are by no means clearly defined. The factors reside more in insidious metabolic disorders and resulting toxæmias rather than in heretofore accepted exogenous agencies.

A common ground of etiology is accepted involving factors of error in the conduct of life, in overfatigue, worries, omissions of wholesome hygienic measures, of watchfulness during progress of infections, etc. These again depend for their baneful power upon changing activity in the sexual glands, in ovaries, in thyroid, etc., which lead by substitution to suprarenal and hypophyseal hypofunction; which in turn derange processes of tissue-respiration, oxygenation, inducing factors leading to production of sclerosis in the vascular apparatus. Psychic and nervous stimuli,—*e.g.*, pain, anger, fear, and, above all, protracted mental application,—cause elevation of blood-pressure, especially in minimal (diastolic) reading. The pulse is also quickened.

Any or all agencies leading to myocardial inflammation or hypoplasia are factors, such as the course of infections, or constitutional

diseases confining persons to bed or limiting the normal course of active life; also mechanical insults, displacements of organs, compressions of vascular trunks, secondary effects of anaemia, hemorrhages, valvular defects, cachexia, and the like.¹

Arterial hypertension is accredited to renal insufficiency as the predominant symptom of nephritic change, often long before graphic evidences appear. Whether this be cause or effect is not determined.²

Dr. Charles E. de M. Sajous, of Philadelphia, states, in effect:³ "While the adrenal secretion acts on the muscular fibres of the heart and of the arteries in general, it has been found that the brunt of this action is borne by the arterioles. When such action is abnormal, we may have the production of arteriosclerosis. All the main causes usually assigned to arteriosclerosis may be summarized by the one word 'intoxication.' All but one (the alcoholic, which has not been studied in this connection) of the morbid conditions known to provoke arteriosclerosis have also been shown to cause overactivity of the adrenals, and the evidence to this effect is further sustained by the fact that Coplin, in an examination of the adrenals of twenty-two cases of arteriosclerosis, found that seventeen were markedly altered; the glands in the other cases being the seat of either tuberculosis or a secondary neoplasm. Briefly, then, the pathogenic agent, whatever it happens to be, excites these glands (probably through their centres) to such abnormal action as to cause more or less reduction of the calibre of the arteries from which the arterioles receive their supply. Deficiently nourished through these, the medial and intimal vascular tissues degenerate, forming the familiar sclerotic patches."

Professor E. B. Cannon⁴ (of Physiology, Harvard), in speaking of the factors involving the production of arterial blood-pressure, says that it is necessary to keep in mind both the discharge from the heart and the constriction of peripheral vessels as determinants of arterial pressure. A low pressure may be due not to vasodilatation, but to a weak heart; and any agency used to increase vasoconstrictor tone under these circumstances is likely to stop the heart at once.

¹ Mayer and Linser, *la Semaine Médicale*, Jan. 1, 1913.

² Aubertin and Parvu, *Société Biologique*, Dec. 21, 1912.

³ Symposium on the Etiology and Treatment of High Blood-pressure, American Therapeutic Society, May, 1912.

⁴ Symposium on Circulatory Disorders, *N. Y. Medical and Surgical Journal*, Nov. 2, 1912.

Until the part played by each of the two factors—the heart and the arterioles—is clearly discriminated, intelligent treatment of any disturbance of normal arterial pressure is impossible.

Dr. Paul G. Wooley, of Cincinnati, speaking of the fundamental factors in cardiac conditions, says: "Leaving aside tumors and anomalies, there are two processes that are at the base of all cardiac lesions—*inflammation* and *degeneration*—these resulting from either mechanical or chemical causes. Either alone or in combination, inflammatory and degenerative changes are able to produce certain states of the heart as a whole which are called *hypertrophy*, *atrophy*, *myocarditis*, *valvular stenosis*, *valvular insufficiency*, *aneurism*, *rupture*, etc. Extrinsic factors operating through the vagus or sympathetic nerves produce physicochemical changes in the myocardium and in the muscle-cells of the bundle of His which cannot be distinguished with the eye or other optical apparatus, but which lead to various clinical effects."

III. Treatment of cardiovascular disorders, to effect cure, should be initiated so early in stages of evolution as to amount practically to prevention. Since there are no characteristic early symptoms, reliance must be placed on rational forms of living and prompt recognition of dangers in neglecting evidences of certain functional disturbance. Hence the key to best results lies in making clear the perils of faulty personal conduct, and also the importance of expert guidance and control throughout life.

Until mankind becomes aware of the deep significance and economic value of medical supervision when in health, and of prompt consultation when even slightly out of health, this conservation cannot be effected. The clinician is confronted with prevailing prejudices difficult to overcome. Among grave influences for harm are the apostles of over-optimistic health-cults who deny disease.

In courageous persons there is always the instinctive and commendable tendency to disregard trifling ailments. Hence an enormous increase of cardiovascular disorders is noted, if not in actual frequency of occurrence, assuredly in their recognition as direct, but particularly collateral factors in terminal phenomena of death. All this constitutes a plain, convincing lesson for the community in the economic value of early and continued medical supervision. Harm cannot come of seeking advice for slight derangements. No reputa-

ble physician will magnify negligible ailments. Every one is aware of the significance of positive and negative suggestion.

Aside from the need for dietetic regulation, large resources lie in pursuing conservative personal hygienic measures. This is always practicable for every one, in whatsoever position in life involving no real sacrifice of time, duties, or pleasures. The key to cardiovascular health is to eat slowly, to rest often, to keep the skeletal structures sufficiently active, and to achieve mental equipoise.

IV. When blood-pressure is found to be abnormally high, we are confronted with either temporary or acute disturbances demanding prompt precautionary and remedial measures. When this phenomenon appears in persons otherwise vigorous, especially toward or after middle life, it may, and usually does, indicate structural changes in the blood-vessels pointing to advanced disease. Recognized in time, the advance of the disease process can be so modified as to constitute clinical cure. Also, there are sensory derangements, amounting at times to pitiable distresses, relievable by lowering tension. Hence the problem before us, viz., to utilize those measures other than drugs whereby vascular hypertension can be safely lowered and kept on a relatively innocent plane; or, when secondary low tension arises, meet the exigency with equal promptness and thoroughness.

We have here a fruitful domain for conservative therapeutics, not hitherto accredited by the profession or the community with its true value. When pronounced vascular hypertension persists, accompanied by structural disintegration, the best we can do is to palliate, to conserve damaged structures, to enhance comfort, and to prolong life.

V. A mechanistic concept of the cardiovascular apparatus may be outlined as follows:

The circulating mechanism consists of a pump, the heart, and three reservoirs: (a) a high-pressure reservoir, the arterial; (b) a low-pressure reservoir, the venous, and (c) a negative-pressure reservoir, the lymphatics. The high (arterial) and the low (venous) are connected by tubes of decreasing size,—arteries, veins, arterioles, venules, and capillaries. Pressure in the arterial reservoir depends on the ability of the heart to pump into the reservoir more rapidly than the blood can escape through small openings which connect with

the venous (low-pressure) reservoir. The size of these outlets is controlled by nerve-centres acting upon the muscular walls of smaller arteries, whereby they are made to dilate or contract as needs of the body vary.

When peripheral vessels, arteries, capillaries, contract, the blood escapes into them less rapidly and the heart-power is manifested as counter-pressure, and the vascular pressure rises so long as the heart can put forth energy enough to sustain action.

The slow, deliberate action of lymph-propulsion exerts a valuable effect on the work of absorption, transudation, diffusion, dialysis, chemotaxis, and the like, and nobly supplements the major circulation by compensating the effects of high or low tension.

The heart and vessels may be considered as one organ, the vessels acting as ramifying branches of the heart, existing throughout the body. Influences which affect the heart also affect the vessels.

From the standpoint of chronic cardiovascular disease, hydrostatic conditions may be divided into variations of low pressure, high pressure, and secondary pressure.

In low-pressure conditions the fault is chiefly in the heart—the pump—which is weak from some cause. The difficulty may lie in the valves (stenosis or insufficiency), the muscle (inflammation or degeneration), or a generally crippled state due to pericardial inflammation; thereupon normal arterial pressure (hydrostatic equilibrium) cannot be maintained in the arterial reservoir.

In high-pressure conditions the trouble is a disorder of the arteries, generally the smaller ones. There are also changes in the lumen of the vessels; also psychic factors, toxæmias, etc., inducing arterial spasm, which must be evaluated.

Remedies are safest when they interfere least with larger direct mechanisms and enhance those agencies which are compensatory, such as regulation of activities, and rest of mind and body.

In brief, the circulation in the highest animals may be regarded as based on five primary groups of principles:

- (1) The mechanical arrangements.
- (2) The chemical changes by which it is maintained.
- (3) Its modifications by glandular secretions.
- (4) Its regulation by nervous agencies.
- (5) Adaptation and compensation along the whole line of activities, rest,—in short, environment.

VI. Cardiovascular Regulation by Physiodynamic Agencies.—Vascular balance is subject to so many diverse and striking alterations from accidental or temporary influences that these adventitious agencies must be reckoned with in connection with any clinical problem. They can aid as well as harm. What these exogenous agencies are, and to what degree their reactions on the integrity of the vital processes are beneficial, hurtful, or indifferent, needs to be known and evaluated in each instance.

Large variants in cardiovascular poise doubtless occur within the zone of safety beyond what we now know or realize. Here is ground for research wherein the general practitioner can and should make important contributions.⁵

Blood Ptosis.—A most careful physiologic generalization is described by C. Ward Crampton (*N. Y. Medical Journal*, Nov. 8, 1913). The efficiency of the vasomotor system is shown by variations in pressure and pulse-rate on rising from the recumbent to the erect posture. This fact is used as a test of competence for athletic competitions.

In the normal man the blood-pressure will rise from 8 to 10 mm. Hg on assuming the erect immediately from the recumbent posture. In one damaged by disease, overwork, sedentary life, and like depressing conditions, the blood-pressure will fail to rise, and may actually fall as much as 10 mm. Hg.

The heart-rate (pulse, etc.) here acts in exactly the opposite way. It increases in rapidity, accelerating in proportion to its weakness, as much as 45 beats per minute, and only in exceptional cases falling.

These two adjustments are interdependent, one often masking the failure of the other. Both must be considered and balanced. To judge from the blood-pressure *alone* would lead to grave error.

The physiologic facts to be borne in mind (according to C. Ward Crampton, *op. cit.*) are these:

“If the blood were contained in flaccid tubes without support, it would, upon standing, drop to the lowest possible point and remain there. There would be none to reach the heart and none would be pumped to the head. A complete blood ptosis would occur and death would result at once. This does not occur because there is some mechanical support and the blood-vessels are not flaccid, but held to a

⁵ See researches by E. O. Otis, C. Ward Crampton, O. S. Lowsley, C. Hertzell, and others.

narrow lumen by circular muscles, in turn controlled by the sympathetic nervous system. The most capacious system of blood-vessels in the body is the splanchnic veins: these can hold all the blood volume if released from the vasoconstrictor efforts of the nervous system.

"In the perfectly normal there occurs, upon rising from the recumbent position, a vasoconstriction effort which squeezes these veins and raises blood-pressure, which more than overcomes the added hydrostatic load. In the subnormal this vasoconstriction effort is relatively weak and ineffective, and does not raise the blood-pressure in the upper body, but allows it to fall under hydrostatic pressure. There is a blood ptosis due to the relative failure of vasomotor tone. This may be mild, merely a failure to raise the pressure, or a fall of the systolic pressure five or ten millimetres, in which case we may still call our patient fairly normal. It may be a more complete failure, allowing the systolic pressure to drop to forty or fifty, at which point the patient faints from cerebral anaemia. This is the familiar picture seen when a convalescent patient with vasotone damaged rises prematurely from a sick-bed, and, robbing the splanchnic veins of mechanical support by emptying the bladder, falls to the floor."

When structural integrity exists in the cardiovascular-renal domain, few or no untoward effects follow from extensive disturbances in pressure-balance. When continued beyond certain limits (as yet not clearly formulated), destructive effects undoubtedly begin. What these effects are—both the nature of the earlier effects and the limits of structural endurance—is a factor in treatment and in prognosis. What other morbid influences, inherent and acquired, are also at work, and what relationships they bear to the solution of the problems presenting, must always be considered.

Among these accidental determinants of variants in vascular pressure occurring in daily life are: Emotion, especially anger, fear, or worry; extremes of heat and cold, of excitation, overexertion, enforced passivity of one part while another is under strain, overfatigue, prolonged fixed attention with inadequate motor outlets; in short, whatever pushes the forces of life too far from the base-line for functional and structural endurance.

Take as illustration the familiar effects on circulation of heat and

cold. It is well known that coolness, such as moderately cold air or water, raises blood-pressure; *per contra*, intense cold, especially when prolonged, produces effects like shock. Warmth, especially prolonged warmth, lowers pressure; yet great heat causes rapid rise to an extreme and perilous degree (notably the hot bath 100° to 110°) for longer than a few moments (variants in endurance occur in individuals, in types and races, under diverse climatic conditions, etc.). Intense emotion, such as anger, likewise first sends the pressure far up; then, during reaction, it may go so far down as to imperil health or life.

VIII. In determining what measures and how much effort shall be used to lower blood-pressure, it is well to bear in mind the vaso-motor factor in its variants, its sufficiency and insufficiency. Albert Abrams emphasizes the importance of taking instrumental readings in both the recumbent and standing positions. There is normally a variation of 15 to 30 mm. Hg higher in the standing position, owing to a compensatory vascular contraction during exertion.⁶ In vasomotor insufficiency this variation is reversed,—e.g., in neurasthenia, notably in the neuropathic form (“splanchnic neurasthenia”), pressure is lowered by standing.

To test difference between ventricular force and vasoconstrictor force Abrams uses an inhalation of amyl nitrite, which dissipates the vasoconstrictor and enables one to estimate the ventricular force. Normally the increase after amyl nitrite is 6 to 10 mm. Hg. In cardiac enfeeblement there is a fall of pressure, and the degree of the fall is an index of myocardial insufficiency.

Now, since vasoconstriction may and does compensate a failing heart, it is more than doubtful whether it should be artificially relaxed. Abrams asserts it is far better to strengthen the heart-action and thereby relieve the hypertension. This he does by mechanically stimulating the myocardium, by concussing the seventh cervical vertebra, and inducing the reflex of contraction in the heart-muscle. Also, concussion to the second and third dorsal (thoracic) vertebrae for five minutes will lower pressure for many hours, even to the following day.

To raise blood-pressure (in hypotension), concussion on the

⁶ See also C. Ward Crampton, Lowsley, Philip King Brown, etc.

sixth, seventh, and eighth dorsal (thoracic) vertebræ will accomplish something, but not so much as concussing the seventh cervical in hypertension, and effects are noted only after two hours.

A considerable number of cardiovascular symptoms are due to spasms, cramps, in the vessels.

Bing⁷ reports cases of cerebrospinal arteriosclerosis resembling neurasthenia, vasomotor disturbances of true neurasthenia, affording a predisposition to arteriosclerosis. This may be a paroxysmal pain simulating neuralgia; the boring, lancinating character of the pain suggests cramp in the vessels. Motor disturbances of the type of intermittent claudication (of the spinal cord) are more common.

Fleeting paresis of a limb, or transient motor aphasia, may be induced by cerebral arteriosclerosis, borderland cases between functional and organic disturbances. Treatment is chiefly psychic, reassurance, diet, rest, etc.

H. French,⁸ speaking of high blood-pressure and commoner affections of the arteries, says pressure can only be reduced safely when the muscles are still muscles; so that "it can be put again in training by arterial gymnastics and so brought back under control of the vasomotor system, to the great relief of the heart. . . . If the patient is to continue life in anything like its full activity, the heart must be enabled to maintain its compensatory high pressure, for which purpose drugs are useless, whereas cardiac training by regulated massage and exercises is far more efficacious."

IX. After these brief remarks let me present a working outline of remedial (physicodynamic) agencies of use in cardiovascular-renal disorders which have afforded me personal satisfaction. Elaboration of some of the measures follows:

(1) *Preventive Measures*.—Bettering the status of the individual by improving environment: through regulation of conduct, habits of living, of work, play, and the like. Laws should be formulated and enforced compelling employers to recognize safe limits of human endeavor, so that greed shall be curtailed by enactments, and danger-points of human endurance shall not be overpassed. Also, standards of conduct should be inculcated whereby the individual shall not exceed in productive energizing, driven by pride, ambition, envy, or

⁷ Berlin, med. Woch., August, 1912.

⁸ Lancet, July 19, 1912.

fear of want. Strained attention unduly prolonged makes for vascular degeneration, unless relieved by normal outlets for energy.

(2) *Education in Mind-Control*.—Relief of psychic hypertension by explanation, persuasion, rational suggestion, training in motor relaxation, whereby equilibrium shall be secured in the psychomotor domain between initial impulse and motor energizing, conscious or unconscious.

(3) *Respiratory Education*.—Training the breathing apparatus to take in and expel increasing volumes of atmospheric air, thus increasing oxygenation, oxidation, tissue-respiration. This is achieved by amplifying lung capacity, enhancing mobility in the thorax, eliciting the coöperation of auxiliary respiratory mechanisms; among the chief of these agencies being the diaphragm and external abdominal muscles. These act as a pump whereby the abdominal areas are emptied, the blood and lymph forced away from areas of stagnation (splanchnic distribution) and toward the right heart, thus returning it to the general circulation. The apices of the lungs need special attention and distention.

(4) *Regulated Movements; Kinesitherapy*.—Systematic employment of (a) passive, (b) active, (c) resistant, alternating later with (d) coöordinated, purposive movements, acts, and (e) free activities. Surface relaxation is thus induced and heat readily lost, hence the need for covering the body after exertion till circulatory equilibrium is restored.

Action should always be alternated with rest periods of equal length,—e.g., half-hour of action, half-hour of rest; also *terrain-kur*,—steady walking, specified periods of time consumed and gradations of lift, of speed. A short nap is of great value, after active or passive energizing, to restore balance of mental and nervous control, to adjust the cardiovascular apparatus, as well as to secure hydrostatic equipoise.

(5) *Manotherapy, Manual or Mechanical Stimulation by Pressures or Repeated Light Blows (Concussion or Sinusoidalization), Vasomotor and Cerebrospinal Reflexotherapy*.—Skilled hand-treatments, not alone as massage, but by expert pressures exerted with precision on certain neural landmarks. Thus vasomotor regulation can be accurately controlled and vascular equilibrium assured. Also, by concussion on defined areas at or near the vertebrae, the reflexes

of contraction and dilatation can be elicited.⁹ Here again we may employ with special advantage lifting of the skin and subdermal structures.

(6) *Skin-Friction*.—Skin-stimulation by surface-friction and deep dermal and subdermal manipulation, a measure, in my opinion, of the utmost practical value in cardiovascular regulation.

(7) *Colonic Irrigation, Enemata*.—With or without saline ingredients or artificial blood-serum. To clear the colon of putrefactive materials—faeces, bacteria, vitiated intestinal fluids, mucus, etc.; to relieve stasis, also to act as a diuretic, there is no more efficacious diuretic than water forced into the bowels.

(8) *Baths, Hydrotherapy, Balneotherapy*.—Cold and hot baths, local, general, or full. (N. B.—Extremes (e.g., below 70° or above 100° F.) must be avoided always.)

In hypertension the best bath is the neutral immersion bath, 88° to 94° F., continued from fifteen to thirty minutes, adding sufficient water to make it comfortable as water cools. The addition of sodium chloride and calcium chloride is often of advantage. In hypotension a brief hot bath raises pressure often to advantage. Cool douches aid in raising tension.

(9) *Bloodletting, Venesection, Phlebotomy*.—General or local abstraction of blood. In hypertension, abstraction of blood is often of great value to relieve grave symptoms, even to save life. The contra-indications are few. Venesection is a far more powerful agency for relief of congestion, stasis, oedema, cerebral irritation, threatened uræmia, in averting extravasation, than are sweatings, drugs, purgings. It is especially indicated when suffocation occurs, dyspnæa, orthopnæa, and in threatened convulsions.

(10) *Dietetic Regulation*.—It is important to bear in mind that intestinal indigestion may exert grave influence; also anaphylaxis to certain proteids (e.g., L. F. Bishop recommends "the few proteid diet"); the importance of excluding alcohol and other narcotics, excess of caffein, etc.; also all articles of food which produce derangement of function, etc. Water-drinking, fluid-intake, should be encouraged so long as the heart remains competent; when vigor begins to fail, it is necessary to restrict intake of fluids.

⁹ See "Spondylotherapy," by Albert Abrams, Fourth Edition.

II

Education in Mind-Control.—Relief of psychic hypertension, psychomotor imbalance, by training in motor relaxation, by explanation, persuasion, rational suggestion, whereby equilibrium shall be secured in the psychomotor domain between initial impulse and motor energizing, conscious or unconscious.

During periods of physical and mental excitement, especially in "highstrung," "hair-trigger" people, extrasystoles may occur. Relief of these cardiac arrhythmias is often best afforded indirectly, or by giving attention to the mind primarily, and until this is achieved little else is needed, except the corollary rest or a substitution of interests. Mind-control includes an expert revision of the patient's life, habits of work, play, rest, diet, and the like.

Disturbances of cardiac rhythm may foreshadow serious disease of the heart. They do not of themselves, however, constitute a bad prognosis, and are no indication for treatment directed to the heart. So largely does the factor of psychic disequilibrium interfere with precision of diagnosis that it is the part of wisdom to give undivided attention in all cases to securing mental equipoise, the better to estimate the somatic status.

It is the experience of clinicians that many sufferers from vascular hypertension manifest strained attention, anxious, exhausting repressions, fear psychoses, in greater or less degree. This leads to a wastefulness or suppression of energy, or its opposite, prodigality of action and reaction, exhausting gravely needed forces; also to agitations, often well hidden, inducing reflexly distressful perturbations, especially in the psychomotor sphere. These psychic states react hurtfully upon metabolic processes, increasing formation of toxins, which in themselves are causes of vascular hypertension. Strained attention is the equivalent of excessive work unrelieved by adequate repose periods. Oxidation is thereby lessened and a vicious circle maintained in the somatic and psychic domains. Here we have the domain of arterial spasm or cramp, a temporary but vastly puzzling factor.

These disorders of feeling-tones may originate in inherent oversensitiveness to emotional influences, or in faulty habit-formation; often they are the direct result of morbid somatic phenomena due to

the causal factors of vascular hypertension. True it is that by systematic training in relaxation not only are the psychic phenomena readily modified, but the somatic phenomena are equally improved. The method recommended is a gentle training in habits of relaxation and tranquillity, an essential part of which is soothing regulation of motor impulses, inducing right habit-formation, and economies in customary movements.

The basis of education is mind-control. Briefly, the patient must be taught to act, to energize, with just enough expenditure of initial mental and motor impulse to accomplish a given result, and not one bit more. It is convenient to begin with respiratory education. I have observed by accurate measurements that these psychomotor exercises often reduce blood-pressure notably. Space forbids elaboration here and now. No single factor in cardiovascular imbalance demands more careful attention.¹⁰

III

Respiratory Education.—The function of breathing being involuntary, instinctive, most persons (including clinicians) lose sight of the significant fact that the muscles concerned in the act are also voluntary. Exertion stimulates respiration, hence those who most condone or enforce sedentary forms of life for cardiopaths are more or less aware that it is a desirable thing to make occasional exertion, in order to compel fuller respiratory interchanges. In severe disease of the heart, especially the acute forms due to infections, also in serious myocardial degeneration, absolute rest is imperative.

In each and every kind or stage of heart-disease there is urgent need for full oxygenation. Activation by exertion being often out of the question, we can have recourse with confidence and hopefulness to "deep breathing," or, better, expertly-directed respiratory education. While my personal experience in diseases of the heart is not so large as some, it is fairly broad, and I can truthfully aver that no case has come under my observation where, sooner or later, the use of breathing exercises failed to be of service. Often, in a long period of enforced horizontality, has graduated and gently-increased respira-

¹⁰ See paper by the author, "Psychic Hypertension, Restoration of Mind-Control by Motor Training in Relaxation," INTERNATIONAL CLINICS, vol. iii, Series 22.

tory encouragement added greatly to comfort, quickened convalescence, abetted more complete recovery. Nay, more: by means of systematic respiratory training in bedridden cardiopaths I am absolutely sure general health was in most, if not in all, markedly benefited. The subject demands fuller presentation than is permissible in this communication.¹¹ Let me briefly outline a few of the salient points.

To secure full benefits from voluntary breathings, attention should be given (1) to the action of the abdominal muscles, training the subject to alternately thrust the navel as far forward and to draw it as far back as possible; (2) to training those muscles and the diaphragm to draw the abdominal contents *inward* and *upward*; (3) to inflating the thorax moderately, to be followed immediately by *inward* and *upward* traction of the abdominal walls during the act of complete expiration. Then follow (4) the combined acts of inflating the thorax to the uttermost, holding maximum intake an appreciable time, and then *forcefully expelling all the air*.

Curiously enough, it is almost impossible to teach these sensible acts to some people, notably to older persons, short of days or weeks of patient effort. Is the trouble worth while? Emphatically, *yes*.

It is obvious that by these procedures we can, by the most economic and safe means, secure a degree of oxygenation in a few days or weeks which is nearly the equivalent of hill-climbing or active sports. All this is gain in time, in release of splanchnic congestion, in distribution of body fluids, in elimination, while the patient lies absolutely flat in bed, with no exertion to the skeletal muscles (at least those of the limbs) and throwing no strain on a weakened myocardium.

To be sure, there will often occur minor phenomena of slight discomfort, such as "dizziness," even faintness. These always follow any sudden or marked change in circulatory balance. While such phenomena are not wholly negligible, the entire procedure can be so promptly regulated or omitted that no harm can ensue. No pounding of the heart occurs such as follows even a change from the recumbent to a standing position. Soon even the feeblest can practise the "tricks," once or, better, several times a day. Not only are the more patent distresses relieved thereby, but urination is also in-

¹¹ See paper by author, "Respiratory Education," *Diet. and Hyg. Gaz.*, February, 1909.

creased by changes induced on internal pressures; tonic action is exerted on vasmotor nerves; on the vasa vasorum; the digestion is enhanced, bowel action encouraged. In fact, general tonic effects are plainly apparent to the most skeptical. Should any bronchial catarrh coexist, it is markedly lessened by forced expiration.

So much for respiratory "gymnastics" for the bedridden. Conspicuous, also, are the effects in convalescent and protracted states. Oftentimes there has been a gradual adjustment to the lowered index of oxidation, shown in flaccid tissues, blood-vessels, muddy currents in major, and the too often unappreciated lymphatic circulation. The vital index is low, supposedly due to the weak heart, "ready to give out," suddenly to cease; or to obstruction of the kidneys, or to rupture of atheromatous vessels. The real impending trouble is the "flickering out of the lamp of life," which, so far as my concepts teach me, lies in impairment of tissue-respiration.

Clearly, whatever expedites oxidation must go far toward liberating structures overburdened with toxic wastes. Forced,—that is, strongly exerted,—expiratory action makes for enlarged areas of pulmonic exposure of vitiated blood to oxygen. Where else is that beneficent, revivifying effect so demonstrable as in those whose machinery of circulation is impaired?

IV

Remedial Effects of Regulated Movements and Exercises (Kinesitherapy) in Cardiovascular Imbalance.—Among the more experienced in cardiovascular derangements it is the consensus of opinion that judicious activities, movements, etc., are not only valuable but necessary. My purpose here is to present an outline of memoranda, and, at another time, to fill it in. Knowledge in this direction has reached a position demonstrating its reliability and inviting fuller research.

Kinesitherapy is worthy to rank as an important branch of auxiliary therapeutics. A working knowledge of the laws of physico-dynamics is needed, whereby alone diagnostic group-concepts can be made, bearing not only on direct but significant collateral conditions closely related to the status of the organism as a whole, to physiologic resources and limitations, to pathologic damage, and the entire question of latent powers which can and should be made available. In every instance it is desirable to estimate the physics

of the factors involved and the variants in direction and distribution of forces.

First, then, what is kinesitherapy, remedial movements, exercises? We may define it as the careful estimation of the physiodynamic status of the individual, with special reference to personal limitations, developmental faults, errors, and damagements; also to determining how inherent resources may be so enhanced mechanically as to make for restoration (relatively) to the norm.

Athletic sports form no part of the conception. Muscle-building is entirely useless as a remedy. Attention should be focused on eliciting the best that is in the individual of structural balance, elasticity, adjustment, normality of actions. Specialized movements, passive and active, should aim to equalize inherent forces, transformation and effects of forces, to relieve overaction, to reinforce weakened structures, to relieve abnormalities in tissue-tone, fixation, rigidity, compression; to remove interferences in action of hydrostatic mechanisms; to invite the normal ebb and flow of somatic fluids, diurnal currents; to give free scope to metabolic energies; to mobilities; to place nerves in positions of advantage, and to lift the burden of mechanical disadvantage from all regulative mechanisms, ductless glands, etc.

Thus kinesitherapy constitutes a large part of our best, most reliable resources in cardiovascular disorders. It forms one of our most agreeable and forcefully recuperative agencies and directly in line with safest natural conservation. To neglect its use is to fail in our duties as conservators of vitality in and out of health.

The dictum of earlier writers on heart disorders that absolute rest, or reluctantly-permitted partial or limited activity, was essential to repair, long dominated opinion. Now it is known and abundantly demonstrated that by means of carefully-devised and applied kinesitherapy a large proportion of immediate distresses, mental and physical, are safely and readily relieved; also, emancipation is often effected from the fate of compulsory invalidism, which is the equivalent of a clinical cure.

Let us glance at the divisions of kinesitherapy ordinarily accepted, any of which—sometimes all—have proved of inestimable value in cardiovascular-renal disorders.

(1) Hand-treatments, manotherapy, massage, nerve-pressures.

- (2) Passive movements, performed by the physician or other expert.
- (3) Resisted movements, partly active, partly assisted by patient.
- (4) Expertly-directed, specialized active movements by patient.
- (5) Free movements, directed and controlled; also the whole domain of permissible free spontaneous activities.

Combined with these, some simple mechanical devices are often of use,—*e.g.*, sinusoidal currents, concussion of spinal areas, pressures, etc. The physician has need to know and appreciate the clinical effects of certain significant limitations of movement in the vertebral structures, some of which exert a damaging effect upon vasomotor and other innervation and must be removed.

What is a remedial exercise? Remedial exercise is the use of voluntary muscles in such a manner and degree as shall be determined to best stimulate normal or competent structures, and bring about improvement of function in disordered structures, and also to exert reparative effects on disordered vital processes.

It may be accepted as a working axiom that suitable use of muscles is essential to maintain integrity in somatic physiodynamics. Disease, protracted beyond certain limits, is followed by local and general damage or disintegration, more or less disabling.

To those who deny the above statements it may be urged that individuals vary in kinesiatric needs, by reason of variants in tissue-tone, local and general, whereby uniformity in functional interchanges is sustained. In health, some individuals are so well endowed as to require little or no free bodily activities. During states of unhealth it is otherwise: differences in degree occur, varying in accordance with the character and extent of existing disabilities.

In determining what is needed, and why,—*i.e.*, the indications for kinesitherapy in cardiovascular-renal disorders,—it will aid judgment to briefly review some of the causal factors. The exclusion of others is due to lack of space.

In searching for the *fons et origo mali*, it may be necessary to assume an infection; or perhaps it is enough to accept certain departures from forms of life essential to maintain structural integrity, which, however, give no—or merely inadequate—indication till disintegration changes have begun.

Few escape some form of infection at some time, hence weak

links arise in an otherwise competent chain. The significance of body-formed poisons is now known to be large: how large is as yet undetermined. This much is known: that by living the life of a normal human animal, including judicious activities, the by-products of metabolism are eliminated so well as to permit the individual to escape ill-effects otherwise destructive. Where active or subacute effects of infections exist,—e.g., pus or other foci of infective agencies,—they must be determined and removed.

In view of the marked increase in prevalence and destructiveness of cardiovascular-renal disease, actual or brought sharply to attention by investigative carefulness, life insurance companies have tabulated their findings, with the result that a working axiom is enunciated covering one ground for fresh warning and conservation, to wit: *those cases showing insidious changes in circulatory structure are uniformly larger around the waist than the chest.* This indicates that catabolism outruns anabolism.

Leonard Hill¹² presents a vivid picture of causal agencies for vascular hypertension, viz.: a healthy man or woman giving protracted, strained attention to occupation, whereby tension is raised, usually omits the compensating relief of muscular action, whereby full oxygenation is secured. He says that man can withstand very marked increase in the amount of carbon dioxide in the air and considerable diminution of the oxygen without being aware of the changes if the air is kept in motion. He further finds, by means of the extremely delicate anaphylactic reaction, that exhaled air does not contain any proteid material which is absorbable through respiration. As to muscular exercise, its beneficial effects are innumerable: it relieves the heart through muscular emptying of the veins; it replaces fat by muscle, and thereby prevents the stagnation of blood in tissue which does not spontaneously expel it; it increases oxygenation of the tissues, and many other good results accrue from indulgence in it, including a marked improvement in digestion and metabolism.

The brain-worker or the desk-man accelerates his heart by his work, and his blood-pressure is raised, but he has neither muscular movements accompanying changes of posture, nor full respiratory pumping to aid the heart in sustaining circulatory balance. Hence

¹² *British Medical Journal*, Sept. 14, 1912.

a high blood-pressure is maintained for long periods by vasoconstriction of the arteries of the lower parts of the body, and thus, perhaps, arise those degenerative changes in the circulatory system which affect men tireless in their mental activity. Long-continued high arterial pressure, with systolic and diastolic pressures approximately the same, entails a stretched arterial wall, and this must impede the circulation in the *vasa vasorum*, the inflow of tissue lymph and nutrition of the wall. The maintenance of a high degree of resistance to bacterial infection is greatly dependent upon sufficient exercise in the open air, and the proper education of the body to respond to temperature changes in the surrounding air. It is not low temperature which causes "colds," but low resistance to temperature changes.

Dr. O. S. Lowsley, of Baltimore, says¹³ all types of prolonged exercise which cause an increase in pulse-rate cause also a rise in systolic and diastolic pressures. The systolic pressure shows the greater rise; hence there is an increase in pulse-pressure, which may be interpreted to mean that the heart-beats are augmented as well as accelerated. After all types of exercise studied, the systolic, diastolic, and pulse-pressures invariably fall below normal and remain in this subnormal condition for a considerable time. The more exhaustive the nature of the exercise, the longer will be the subnormal period which follows. Systolic pressure invariably falls more rapidly than diastolic, and hence the pulse-pressure becomes weaker. Pulse-rate, which always increases during exercise, decreases rapidly after its completion. Rapid exercises (vigorous, fatiguing, and exhausting) are followed by a fall of pressure below normal, which lasts longer than after moderate exercise, even if the former is continued only for a very short period and the latter for quite a long period.

J. H. Mitchell Bruce,¹⁴ speaking of cardiovascular degeneration, warns against overlooking "those secondary causes of cardiac embarrassment."

Threatened decompensation, whether by affecting nutrition of the walls of the heart, or by suddenly raising blood-pressure, anxiety,

¹³ "Effects of Various Forms of Exercise on Systolic, Diastolic, and Pulse-Pressure and Pulse-Rate," *American Journal of Physiology*, March, 1912.

¹⁴ *Lancet*, July 22, 1911.

ambition, misfortune, or fierce determination to cure by active exercises, overtaxes an enlarged and softened heart.

E. Grawitz¹⁵ says that the development of the lymphoid bone-marrow in early childhood is favored by muscular exercise, and the lack of it induces a tendency to blood affections in later life. He cites this as one of the reasons why girls are more inclined to anæmia and to chlorosis than boys. Appropriate prophylaxis from earliest infancy will prevent the development of serious blood affections later. Other factors that coöperate in the production of blood affections are chronic losses of organic juices, as in suppurations, also nephritis, hemorrhages, and the influence of toxins. Iron and arsenic waters affect the blood favorably, and the climatic factors and exercises in the mountains are of benefit, although the supposed increase in red corpuscles is now considered merely a mechanical phenomenon. One of the most important factors in climatotherapy and balneotherapy is the cure of the digestive disturbances of the congestions and auto-intoxication.

R. H. Babcock,¹⁶ in describing the medical gymnastics he says he employs, lays stress on certain points. The patient must *not* hold his breath during these; must breathe regularly and deeply, in rhythm with movements; to inspire or expire, according as the chest is expanding or contracting, as the diaphragm rises or falls. The fundamental integrity of the myocardium is restored by increasing venous flow on the one side, and by dilating the intermuscular arterioles on the other; also by enhancing cardiac metabolism. If dilatation and inadequacy are pronounced, the so-called resistance exercises are preferable: these aid deep breathing, and cause no strain on the heart-wall.

Büdingen, in similar conditions when far progressed, lays emphasis on the need of rest in bed during periods of extra weakness; at the same time to perform partly passive and partly active movements, especially of the legs, while recumbent. Thus no strain is placed on the heart. Benefits are surprising in severe heart-disease. "Even in ruptured compensation," œdema subsides, liver returns to normal, and signs of cardiac insufficiency rapidly subside. The vicious circle is broken up.

¹⁵ "Blood Diseases and Balneology," *Berlin. klin. Woch.*, xlii, No. 19.

¹⁶ *American Journal of Medical Sciences*, Jan., 1909.

Free Activities.—Man, being a mammal and not a mollusk, requires abundance of free activities, not only to develop structure and differentiate function, but to sustain vigor and maintain oxygenation. Motion leads to thought among primitive humans, also in the young of moderns. First signs of mental possibilities arise in earliest evidences of muscular vigor, the voluntary movements beginning to replace reflexes. Specialization demands variety and continuity of motor energizing. Elasticity, a fundamental condition of organic integrity, can be maintained only by free and constant use of muscles.

By labor—and to the point of sweating—must man work out his physical salvation. There is no safe, short cut along flowery paths of ease. Some may seem to escape, and to a great age, but perils beset the way of all men, of whom the largest number die from cardiovascular degeneration, either as the primary, but far more often the terminal, cause of death. During serious acute illness, of course, repair can be obtained only by absolute rest. Extensively-damaged valves or myocardium or vessel-walls, aneurism, etc., demand limitations of action.

So soon as acute or grave conditions are relieved and the organism safely returned to a plane of steady advance, structures begin to demand motor energizing. Neglect of activities is inevitably followed by increments in accumulations of toxic wastes beyond the power of elimination. Only by muscular action is the balance of the oxidative processes assured, end-products reduced to eliminable forms. Suboxidation is the accumulation of explosive products, inducing destructive action in vital structures, to which those of the cardiovascular-renal group are peculiarly susceptible. The action at first (and sometimes for long periods, or even for the residue of life) must be passive or assisted, or possibly slightly opposed. As condition warrants, they can and should be increased with advantage till free and spontaneous.

Until the last decade, leaders of medical thought possessed only so much exact pathologic knowledge as made them aware of the need for absolute or partial rest when gross cardiac abnormalities were revealed. They wisely carried their caution as far as needed—often too far. Valvular disorders occupied attention to the exclusion of the now well recognized, but then obscure, myocardial disorders. Renal disorders were not incorporated into the same

clinical concept. Now it is well established that these should be grouped together; that we must look to the "cadaveric alkaloids" toxic wastes as the efficient, possibly the primary, cause for most or all of these diseases.

At least, it is well determined that all reasonable means must be employed to sustain equipoise in the processes of oxygenation and oxidation. The one agency which can be relied on to meet the largest variety of needs is free action of the voluntary muscles. What this muscular action, these free activities, shall be, the amount of energy which should be expended, differs for each case and in each stage or exigency. All this is the province of the clinician. Above all, the patient needs first to be taught to know where he stands in the scale of disability and how to exercise right judgment in energizing. This is neither the time nor the place to elaborate forms, kinds, and degrees of free activities. Suffice it to conclude this chapter with the general statement that by free activities can most cardiovascular-renal disorders be prevented, and by their judicious employment can a large part of such troubles be carried on toward clinical cure.

It is a valuable corollary to free activities to rest lying down for so long a time as the period of activity, especially for those weakened by disease. A short nap is invaluable in restoring balance in the circulation.

V

Manotherapy.—Manual or other mechanical stimulation by pressures or repeated light blows (concussion or sinusoidalization), massage, local or general. The effects of raising or lowering blood tension, also in distribution of blood and body fluids, are produced reflexly through the vasomotor and the cerebrospinal systems of nerves. These can be elicited by pressure or blows upon certain well-defined areas: the vasomotor reflexes directly inducing an opening and closing of the arteries; the cerebrospinal by stimulating or depressing vagus-tone, also eliciting the reflexes of contraction in the hollow viscera.

Below is an outline of the physiology of vasoconstriction and vasodilatation (condensed by M. Arnold Snow) from Sajous:

"1. Vasodilation is due, in the case of arteries and veins, to the

diminution of blood-plasma, and, therefore, of adrenoxidase, in the muscular layers of these vessels.

“ 2. The blood-plasma being supplied to the vascular walls by the *vasa vasorum*, it is through contraction of these nutrient vessels that dilation of the vessels is caused.

“ 3. The *vasa vasorum* receiving their blood-plasma from larger arterial vessels supplied with vasoconstrictor nerves, it is through vasoconstriction of these vessels that the volume of the blood circulating through the *vasa vasorum* is diminished.

“ 4. It is therefore by vasoconstrictor action that vasodilation is produced, ‘vasodilator nerves’ having no existence in fact.

“ 5. Vasodilation being caused by constriction of the nutrient arteries of a vessel, the vasomotor nerves supplied to these nutrient vessels should not be termed ‘vasodilators’ but ‘setriodilators.’

“ 6. The mechanism of vasodilation is that through which all exacerbations of activity in any organ, whether belonging to the alimentary, circulatory, locomotor, visual, auditory, or any other system, is incited and sustained.”

The effects of concussion or vibration on the cerebrospinal nerves, inducing the reflexes of contraction or dilation, as outlined by Abrams (condensed by M. Arnold Snow), are as follows:

“ 1. Contraction of the myocardium is associated with the heart-reflex of contraction. It increases pulse volume and diminishes frequency.

“ 2. If the heart is weak and blood-pressure high, a strengthening of the heart will cause fall of pressure by concussion of the seventh cervical spine. Concussion properly applied can cause fall of blood-pressure. Vasodilators in drugs reduce blood-pressure by ‘paralyzing the vasoconstrictor mechanisms.’

“ 3. If the heart is weak and vasoconstrictors do not ‘compensate the failing heart,’ a strengthening of the heart causes rise of blood-pressure by vibration of the seventh cervical spine. Concussion selectively supplied can raise blood-pressure.

“ 4. Heart-reflex of dilatation increases area of cardiac dulness associated with no increase on diameter of the heart, as ‘heart-muscle can increase the size of its cavities without any corresponding augmentation of tension of its walls.’

“ 5. The aortic reflex of contraction is associated with stimula-

tion 'of the vasoconstrictor nerves or their centres in the cord. They emerge with the anterior roots as preganglionic fibres.'

" 6. The aortic reflex of dilatation is associated with stimulation of the vasodilator nerves or their centres in the cord. They emerge with the posterior spinal nerves.

" 7. Stimulation of the longitudinal muscular fibres of intestines occurs in an intestinal reflex of dilatation.

" 8. Induction of contraction of circular fibres occurs in intestinal reflex of contraction.

" 9. The excretion of indican is promoted after fifteen minutes' concussion of the first three lumbar vertebrae, or corresponding intervertebral concussion, or heavy, slow vibration between the first and second and second and third lumbar vertebrae.

" 10. An increase in volume of liver occurs (reflex of dilatation) by concussion of the eleventh dorsal vertebra.

" 11. Depletion of liver is induced by exciting the reflex of contraction.

" 12. The tone of the splanchnic vasomotor mechanism is augmented by expression of the blood from the abdominal vessels to the right heart. This is effected by concussion of the spines of the second, third, fourth, fifth, sixth, seventh, and eighth dorsal vertebrae, which correspond to splanchnic nerves from the fifth, sixth, seventh, eighth, ninth, tenth, eleventh, and twelfth dorsal nerves; or by corresponding intervertebral vibration.

" 13. A mechanical effect is exerted on the spleen by concussion of the first three lumbar spines, or corresponding intervertebral vibration causing a reflex contraction of the spleen.

" 14. Dilatation as well as contraction of kidney is induced, thus varying its volume, which depends on structural distention and the amount of lymph and blood in its vessels.

" 15. Concussion 'stimulates the motor component of a spinal segment and subdues its sensory constituent.' "

It is abundantly demonstrated that vasomotor regulation can be achieved by the hand or other instrument exciting pressure on the paravertebral tissues and elsewhere. The physiologic explanations are plentifully scattered through text-books and clinical articles, and, even discounting heavily the assertions of optimists, the facts are demonstrable in the laboratory.

To quote from an old paper by the author,¹⁷ a corelationship exists between the blood-supply of all organs and their functional processes. This involves the status of the blood supply in those segments of the cord in which the integral cell-bodies reside and from which the viscera and other structures are innervated.

Explanations of visceromotor and other activities must be sought through utilizing a practical knowledge of the vasomotor mechanism and functions of the spinal segments through which a viscus is controlled.

Effects upon the blood supply of all parts of the body can be induced by mechanically stimulating the centres in the spinal cord more directly and forcefully (and hence, through them, exerted upon the sympathetic centres and ganglia) than by measures directed immediately to the organs disturbed.¹⁸ Conversely, disturbances in the various organs, systems, and tissues being due to circulatory changes induced reflexly through the central nervous system (the major portion of the nervous mechanisms being located in the spinal cord), disturbance of circulation in the cord is expressed by alterations in the vascular tonus in the structures of those parts supplied by the posterior primary divisions of the spinal nerves, as well as of the parts affected. During the continuance of diseased states, or even lesser disturbances, pronounced alterations are to be observed in those tissues immediately innervated by fibres arising in the spinal segments whose integrity is thus affected by derangements in function of organs and areas dependent for vasomotor innervation upon those segments. In brief, there is both a sensory and a nutritive reaction exerted upon the erector spinae muscles and allied structures, ligaments, etc., caused by the disturbed circulatory equilibrium in areas depending for control upon certain groups of segments of the cord.

There is, as has been said, a compensatory relationship existing between, first, the surface muscles and ligaments, skin, etc., supplied by the posterior primary divisions of the spinal nerves; and, second, the blood-vessels of the cord and the deep structures, organs, and remoter parts, innervated by fibres whose cell-bodies arise in the corresponding regions of the cord.

¹⁷ *Brit. Jour. Diseases of Children*, 1905.

¹⁸ See Lauder Brunton's explanation of the effects of a mustard plaster, "Lectures on Pharmacology," etc.

Any agent or irritant, mechanical, electric, infective, toxic, or other, which causes vascular constriction in the tissues of the back contiguous to the spinal column will produce (conversely) dilatation of the vessels in the cord, and of the organs and beyond parts in the line of innervation.

General massage, judiciously applied, is capable of rendering excellent service in vascular hyper- or hypotension. Brisk surface-rubbing, friction, and pinching induce a rise in tension. Sensory reactions are thus produced contributing to mental as well as physical excitation. The most salutary results are due to enhanced lymph-propulsion. Slow, deep kneading, with little pressure, of the limbs and grosser structures raises tension.

Two of my most skilful and intelligent masseurs have made careful observations on patients for a number of prominent clinicians, and I give a summary of their procedures.

In vascular hypertension, proceed with exceptional deliberation and continue for a full hour. Use no excess of force, no quick movements or touches. Lift the lateral muscle-masses, alternately, as taught by Weir Mitchell, and to our classes at the Philadelphia Infirmary for Nervous Disease, revolving and squeezing them slowly, seizing the upper structures and causing them to come away from the lower; rubbing the bones with the soft masses as a washerwoman rubs clothing on a board. The intermuscular septa should also be separated, loosened, the fingers reaching in between and along the fascia, down to the ligaments and bones.

Over the abdomen, affecting the splanchnic circulation, especial care must be exercised, as here the most marked effects are wrought on blood tension. Use an oil, to avoid sensory irritation, the flat of the hand, fingers cupped, action from side to side, over and under, one hand following the other, never compressing the tissues; later lift up the intestines from the pelvic bones with the entire hand (not the fingers alone), simulating a wave-like motion. End with a general vibration of the entire trunk, and rest for an hour; leave surface well covered.

Massage acts on the circulation to the extent that it favors the movement of blood and lymph, lessening the work of the heart. It may be compared in many respects to breathing exercises. By active, forced inspiration a suction action occurs of the blood into the chest, and by expiration it is expelled.

VI

Skin-Stimulation by Surface-Friction and Subdermal Manipulation.—The most efficient agency in securing full peripheral circulatory activity is thorough surface-friction, supplemented by deep subdermal stimulation. Experience convinces me that by use of these measures we can secure more thoroughly and lastingly the compensatory functions of the surface circulation, supplementing the cardiac and deep vascular activities, including that of lymph-propulsion. Skin-friction, involving sharp stimulations along with sensory reactions, also evolution of latent heat, temporarily sends up blood-pressure, seldom hurtfully, and is valuable in secondary low tension. Efficient skin-stimulation includes both surface friction and subdermal manipulation, a forceful loosening of the surface structures from the supporting fascia.

I am of the opinion that, when fuller attention is given to this measure, it will be found to compare favorably with the now well-studied and rightly-esteemed elaborate measures of hydrotherapy. It is so readily applied, so convenient, and withal so simple, that the patient can apply much of it for himself; and an intelligent, deft-handed servant or member of the family can be taught to apply simpler forms impossible by the subject. For best effects an expert is required. It is now known that passive sweating does not relieve nephritic disorders to the extent formerly believed. No more nitrogenous waste-products or salts are eliminated through diaphoresis in chronic kidney troubles than in health. The average cutaneous output in individuals in bed is, according to Loofs,¹⁹ 0.25 Gm. of nitrogen and 0.02 Gm. of sodium chloride per day in both healthy and nephritic alike. The major effects of balneotherapeutic measures depend for efficacy upon vasomotor stimulation, dilatation, and contraction of surface vessels and lymphatics.

Lymph-propulsion, which is a deliberate process of exceeding importance in nutrition and body-waste elimination, is too often not reckoned with therapeutically. Its chemical composition gradually changes as a result of stagnation or partial absorption, to favor one or another law of transudation, till it at length finds its way to the great blood and lymph centres and the lungs. Hence friction and

¹⁹ *Archiv. für klin. Med.*, ciii, 563, 1911.

subdermal manipulation, to be fully effective, must be unhurried, gradual. At first there is some skin pain; after five or six treatments there is practically none.

It is valuable and, as experience will prove, most refreshing to practise steady surface-friction by means of the hand or rough material as both a conservative and a curative measure. The best time is immediately on rising and before going to bed; also whenever the clothing is removed, or after being overheated. Chilliness of the surface, whether temporary or due to hypersensitiveness, feeble elimination, adreno-thyroid hypofunction, or pronounced disease, is promptly relieved by dry friction. Before taking a cool or cold bath it puts a healthy person into the best state to react swiftly and delightfully. For one whose health is impaired, especially when vascular tension is low or the organism is surcharged with toxic wastes, whether arterial pressure be high or low, dry friction invites blood and lymph to the surface—the largest oxygenating machinery of the body, next to the muscles. Whether it immediately lowers hypertension or not, the full activity of surface circulation places the individual in the best condition for relief of vascular spasm, or other interference with free ebb and flow in major and minor blood-vessels.

The object to be obtained in cardiovascular regulation is not merely a sudden drop or rise in tension, but *an equilibrium*. The measure of the value of this equilibrium is the length of time it can be maintained. If due to a rational agency and based on right conservative principles, it makes for permanent progress toward betterment.

Next, of *deep stimulation of dermal or subdermal structures*. Immediately beneath the skin and overlying the muscular and other structures resides a rich grouping of vessels, both arteriovenous and lymphatic, larger, though less abundant, than those of the surface. The derma in many persons, especially those near or past middle life, often becomes adherent to the subdermal supporting structures, impairing circulatory integrity. Attempts to seize the derma and lift it from the parts below are then found to be met with difficulties; whereas in perfect health it is freely movable and wonderfully elastic. Contractures, rigidities, and adhesions have occurred, resulting from one or another morbid process. In my personal experience the forceful, systematic freeing of these adhesions, loosening up the attach-

ments, rolling them back and forth until full original elasticity is secured, contributes enormously to health. It is well known that wherever painful states have occurred (fibromyositis, fibrositis, neuritis, etc.) by free mobilization or separation the structures are relieved from pain. The phenomena are due to restoration of normal local circulatory balance, as well as to removal of pressure on sensory nerve-fibrils.

From this loosening of the skin adhesions is secured not only vasomotor stimulation, dermal and hypodermal vasodilatation, and relief of localized vascular spasms, but also, through the cerebrospinal nerves, are stimulated reflexes of contraction in the hollow viscera so well explained by Albert Abrams. A pain-reflex is also elicited at first which rapidly lessens until, after a few treatments, there is actually no discomfort. It is rather a motor stimulation, inducing marked and readily-demonstrated definite and regular reflexes of contraction, not only in the viscera, but also in the larger arterial trunks. By means of the fluoroscope I have seen the kidney, the stomach, the colon, and the aorta graphically contract. Also, it is quite easy for anyone, at any time, to demonstrate the reflexes of contraction by percussion and palpation. Concussion of the vertebrae (notably of the seventh cervical), as Abrams has pointed out, is the most graphic method. Pinching the surface, as well as subdermal manipulation, induces the same phenomena to a lesser degree.²⁰

The *modus operandi*, which I direct and personally supervise, is as follows:

The skin of the whole torso is seized deeply and lifted up, bit by bit, gently but emphatically, and mainly over the vertebral and paravertebral structures; then it is rolled and slipped back and forth till mobile; then, both hands being used, the skin directly over the backbone is forcibly pulled away from the underlying structures. Oftentimes there follows a sharp tearing or snapping sound, audible to patient or bystanders, as some obstinate adhesion gives way, causing pretty sharp pain. Moreover, this pain-point is definitely related to that area in the spinal cord in which the cell-bodies lie through which are innervated (vasomotorially) the parts or organs in which pathologic processes have long existed.

²⁰This subdermal manipulation was devised by Edward Cordery Lee.

The whole treatment occupies from ten to twenty minutes. Then follows a sense of warmth, comfort, and relief to long-existing discomforts or distresses. After four to eight séances, all especially painful effects of the manipulation are gone.

The most graphic effects of this treatment are: equalization of surface temperatures, a slower and steadier pulse, increase of urination, especially if output has been below normal; greater regularity of bowel action (peristalsis being toned and steadied through reflexes of contraction induced); extremes of vascular hypo- or hypertension are modified—not always to pronounced degrees, but the effects seem more permanent. In brief, the clinical phenomena of vascular equilibrium are induced.

Particular attention should be directed to the *importance of tissue-elasticity as a factor in blood-pressure*. This is a matter of great significance in relation to the skin, the vessels of which contain less muscular tissue than do those of other parts. Cold applications to the skin render it firm and dense, and greatly increase its elasticity, thus tending to raise blood-pressure. This is true of all cold applications to the skin, especially those of two minutes' or longer duration.

Sweating is one of the most effective means of lowering blood-pressure by reducing the volume of the circulating blood. A large amount of blood is withdrawn from the general circulation by the dilatation of the cutaneous vessels, while at the same time the total volume of the blood is diminished by the serum poured out by the sweat-glands.

Skin-stimulation raises temperature in the surface areas, tends to relax sweat-glands, and hence enhances diaphoresis.

VII

Colonic Irrigations, Enemata.—Personal experience with washing out the bowel with water, alone or with chemical substances added, or with oil, has been satisfactory. Cardiopaths especially need to have the bowel freed from intestinal toxics; sufferers from renal disease even more urgently. There are better ways of restoring normal defecation, but enemata serve a useful purpose in emergencies. The one particular value of colon irrigations I have not seen noted is the remarkably *prompt and efficient diuresis* they induce.

As to the supposedly hurtful effects of colon irrigations and

enemata, my personal experiences are negative. Doubtless, any habitual use, or abuse, of so artificial a means of clearing the bowel is to be deplored. Purgative medicines, especially the more irritating ones, even the salines, are more pernicious. The ancient writers (*e.g.*, the Egyptians) speak well of enemata; the Yogis are said to wade into a river and practise voluntary suction of water into the bowel with excellent cleansing effects. There must be some peculiar value in washing out the bowel not yet explained. Quite by accident I learned clinically that colon irrigations exert a very valuable effect on arthritic disorders, especially *arthritis deformans*.

My own use of the remedy is for the purpose of (1) cleansing the bowel, especially of putrefactive products which accumulate; (2) to stimulate impaired peristalsis, or to soothe local irritations, or to relax spasm; (3) to act as a prompt diuretic. Colon irrigations of plain water usually suffice, at a temperature of about 75° or even 60° F., when prompt evacuation is desired. At the temperature of the body little or no response is elicited, and the water remains in the bowel indefinitely, much of it being absorbed—desirable for diuresis.

As to salt (sodium chloride) being objectionable, the question seems unsettled. The Murphy method has much to commend it in a variety of conditions extraneous to this discussion. The chloride of sodium does not seem to be proved of any special harm, even in conditions of nephritis. Martin H. Fisher gives good reasons for his recommendation of the use of alkalies (sodium chloride and sodium carbonate) in conditions of nephritis, upon the ground that the morbid state of the kidney is due to the content of excessive acids.

Not only does colonic irrigation, rightly administered, effect a clearing of hardened faeces, mucus, and detritus far more perfectly than does any laxative, but in certain states of diarrhoea it produces a quieting effect, removes irritating substances, and checks the absorption of toxics.

To clear an overloaded bowel of impaired motor-tone it is wise for the physician himself to administer the enema, at least on two or three occasions; later a nurse or member of the family may officiate. Position is important. The knee-breast posture is the best; or lying on the left side at first until half the amount of water has been introduced, then changing to the right side.

The fountain syringe should be elevated enough to get an adequate pressure—three to four feet. The fluid should be slowly introduced. If colic or “bearing-down” pains occur, the tube should be compressed till the sensation passes; then proceed till two or three pints are introduced. If motor-tone is lost, or the impulse to defecate is weak, the addition of massage to the abdomen is of great use. By lifting the abdominal contents from the lower quadrants, gently compressing and relaxing, the interior is kneaded, the reflex of contraction stimulated.

Ordinarily it is well for the patient to sit quiet after injection until the impulse to go to stool is strong or irresistible. It is often enough to use only a half-pint of cool water (60° F.) by a “baby syringe” to stimulate an impulse to void faeces. Full irrigations are needed only two or three times a week, lengthening the intervals to two or three times a month; meanwhile employing other devices to cultivate the habit-impulse, such as posture, along with movements imitating those of primitive man or four-footed animals, walking on “all-fours” and hopping about, stretching while recumbent or sitting on the floor.

Oil irrigations, after the manner of Kussmaul, are far better to overcome constipation.

VIII

Baths, Hydrotherapy, Balneotherapy.—Cardiovascular anomalies are powerfully and more or less permanently influenced by baths, local or full. Extremes (*i.e.*, above 100° or below 70° F.) must be avoided. Hydriatic measures make heavy demands on the regulative forces of the circulation. Hence they should be used with caution at all times and carefully supervised. Every application should be based on accurate knowledge of the patient’s condition at the time.

For present purposes we may consider the heart and vessels as one organ, the vessels being simply ramifying branches of the heart extending throughout the body. Those influences which affect the heart affect also the vessels.

In treating cases of arteriosclerosis, bear in mind the fact that secondary hypotension may have begun, although hypertension be shown at the moment. For example, one who has enjoyed comfortable health with a pressure of 200 mm. Hg may begin to show

secondary hypotension with a pressure of 160 mm. Hg, and only return to comfort by again raising it. The pressure taken at 7 A.M. was found by Philip King Brown to average about 15 mm. Hg less than the mean for the day. The first meal causes a rise of from 15 to 20 mm. Hg, which seldom falls till late in the night.

Thus it will be plain that, to obtain best effects by hydrotherapy, the clinician must (1) achieve a fair concept of the existing pathologic status, the personal peculiarities, etc., and (2) must begin any baths cautiously. Intelligent experimentation is essential.

In advanced cases, routine or standard measures will not suffice; all need revision, modification, specific adaptation. Physicians prefer to direct bath measures in the home for a number of reasons, chief of which are the regularity and continuity made possible, economy of time for the patient, avoidance of excitement, of fatigue, of annoyance, of repeated undressing; also they are better able to maintain personal supervision.

Then, again, there are instances where it is advisable for the patient to visit occasionally a nearby bathing establishment, to obtain better appliances, skilled attendants, and desirable psychic impressions of the gravity of the procedures. Again, conditions arise where it is best to send the patient to some of the highly-equipped spas, balneotherapeutic establishments, notably those of Europe, that he may systematically undergo a process of cure and after-cure. Great is the power of impressiveness which these places exert: of rigid discipline in every act of the day and night. Habits are thereby formed essential for use later in home coöperation. It is a valuable experience for the clinician personally to undergo a few of the routine and special procedures here and abroad. The chief object of the present communication is to furnish brief hints for the management of patients in their homes.

Avoid all habits long established by usage or tradition, unless one's own clinical experiences and cautious personal tests bear out the concept formed. The heart-muscle is paramount. Study the effects of remedial measures on that, and do not be misled by reports of blood-measuring instruments wielded by inexpert or inexperienced persons.

By keeping in mind the principle that the chief desideratum of baths is to reinforce and sustain the heart-muscle, we can the better

reconcile conflicting views on treatments. For instance, much controversy has raged as to the precise effects of cool, carbonated saline baths (as those of Nauheim) on blood-pressure. While the aggregate testimony is to the effect that cardiopathies of divers sorts are benefited thereby, close observers have demonstrated that in some instances the blood-pressure is lowered, in others raised, in others it varies unaccountably.

The subject is well epitomized by O. Muller, of Tübingen,²¹ who asserts that the carbon dioxide and salt baths excite activity of the heart; the temperature of the bath affects blood-vessels by dilating or contracting them, and protecting and exercising the heart.

Cool carbon dioxide baths (below 93.2° F.) slow cardiac action, making it more effective and uniform. At the same time they contract vessels at the periphery, increase blood-pressure, and dilate arterioles in internal organs, particularly in the abdomen. Hence deepening of the respiration occurs, favorably influencing the blood-current in the veins. This is calculated to equalize the distribution of the blood. The heart is thus compelled to perform greater work through the effects of these changes, hence it is favorably exercised.

The advantage claimed for the CO₂ is that the thick layer of bubbles formed about the patient prevents heat-loss, inducing a pleasant sense of warmth without increasing external heat. By the warm CO₂ bath (about 93.2° F.) the pulse-volume is increased; the effect on the arteries is the reverse of the cool bath. As a result the internal organs receive *less* blood, and the heart has a slighter task to perform, is hence protected.

The full Nauheim bath "always raises blood-pressure in fever, pneumonia, typhoid, septicaemia, etc."²² In treatments the baths are begun at 93.2° F., and in succeeding baths the temperature is raised or lowered from that point, to protect the heart by rest, or to exercise it, as desired.

Personal experience leads me to feel confidence in neutral immersion baths to relieve the discomforts of hypertension: 88° to 94° F., or higher, according to comfort; the patient lying in this for an increasing time, from fifteen to sixty minutes, watching the heart,

²¹ Sixth International Congress on Physiotherapy, Berlin, April 18, 1913, letter to *Journal of the A. M. A.*

²² P. K. Brown, *op. cit.*

which should be quieted and the whole body soothed. These baths exert a most happy effect on psychic hypertension, headaches, inducing refreshing sleep.

The effects of baths on vascular hypertension are, unfortunately, not so permanent as we could wish. In series they tend steadily to lower tension and usually prove of distinct service in preventing sudden rises, so often dangerous and sometimes fatal. In hypotension, cool carbonated baths, as before said, assist in restoring tone to a weakened myocardium. Also douches are of service here, warm to cool, avoiding extremes and employing brisk friction.

Local baths, hot foot- or sitz-baths are so well known as to need no comment. Wet-packs, warm or neutral, applied to a part (as the abdomen), the "Preisnitz bandage," etc., are often of great utility.

The partial electric-light bath, applied in succession to various parts of the body, and continued until the skin is thoroughly reddened, is a useful adjunct for dilating surface vessels and clearing tissues of waste-products. The sun-bath, used with precaution and repeated daily until the skin is thoroughly tanned, is an effective means of combating degenerative changes in cutaneous vessels.

Moderate hydriatic measures of nearly every sort improve metabolism and thus check degenerative processes of the vessels which give rise to high blood-pressure.

All measures which improve the blood supply of the skin and maintain a vigorous circulation in the limbs (*e.g.*, skin-friction and gentle exercises) are useful in cases of hypertension, especially in arteriosclerosis. In such cases great care should be taken to keep the extremities warm and to avoid general chilling. Prolonged neutral baths, hot foot-baths, the Scotch douche to the legs, and leg-packs overnight are useful, but general cold baths must be forbidden.

In mixed cases of doubtful origin, part psychic and part spasm, or possibly arteriosclerotic, with sensory disturbance, daily hot brine-and-mustard foot-baths are indicated, to relieve cerebral congestion, vertigo, headache; also brief tepid full baths (92° to 94° F.) and cold douches (84° to 88°) followed by friction.

In patients with high blood-pressure from advanced arteriosclerosis without kidney lesions the effects of baths are variable; as a rule, little or no effect is induced by any kind. The great value of spas is mainly due to the whole *entourage*, the system, freedom from worries, change of scene and circumstances, the systematized

life, open air, regulated activities, rest, including the special skill exhibited by local medical experts. Also it is now well established that the radio-activity of those waters which actually possess them in definite degrees is of inestimable value. To get the effects one must drink the waters immediately from the source and not imported. Radio-emanations are retained in water only a few days.

IX

Bloodletting, Venesection, Phlebotomy, in Cardiovascular-Renal Disorders.—Bloodletting, in many conditions where the heart and vessels are profoundly disordered, or where infective processes have thrown an overwhelming burden on them, is often the only life-saving measure, and is frequently capable of affording much relief. I have myself several times saved life on critical occasions by this means, and have been in association with many similar cases.

Venesection has fallen into disfavor chiefly because, in former times, the measure was grossly abused, and in modern times death does occasionally follow its use. The cause of death does not lie in the loss of blood induced, which, unless enormous, is scarcely sufficient to produce fatal results. Death is due to coexistent causes then culminating, or to conditions arising beyond control. Objections are often made to venesection by patients or their families because of deep-seated prejudices, and it requires courage to combat these legendary notions. None the less, it often happens that the physician who is turned aside from his purpose to extract blood when the indications are clearly present contributes unwarrantably to loss of life.

Nor do physicians keep clearly in mind the indications for bloodletting. They should realize that because a valuable measure has suffered neglect is no reason for not knowing when and how to use it. In respect to venesection, it is of so vast importance it should be widely recommended, its indications made plain, and its limitations clearly defined. A small, weak, rapid pulse is no contra-indication whatsoever to bloodletting.

Venesection is usually employed as a last resort in cardiovascular disorders in the hope that it may be a life-saving measure. Conditions being extreme, death has occasionally followed; in this respect it is similar to the last-chance measures, such as surgical operation, blood-transfusion, and the like. It has a large field of usefulness as a palliative measure, and therein is to be extolled and practised.

The indications for venesection are, briefly, as follows. We adopt the classification offered by Daland:²³

1. Valvular disease of the heart with marked failure of compensation; cases presenting extreme dyspnoea, orthopnoea, cyanosis, tumultuous cardiac action, rapid, small, feeble pulse, venous distension in head and neck, a feeble apex-beat displaced to the left and seen and felt over a larger area than normal; increase in area of cardiac dulness to the left and right, often concentration of pulmonic sound, especially if these signs are progressive, and if myocardial degeneration is not extreme, then abstract about twenty ounces of blood.
2. In mitral stenosis accompanied by extreme right ventricular dilatation, with failure of compensation.
3. In acute pulmonary oedema, symptomatic of right-heart dilatation, even when patient is almost moribund, venesection may induce extreme relief. (In well-marked myocardial degeneration it is valueless.)
4. In well-marked failure of compensation occurring in the course of arteriosclerosis.
5. In aneurism of the aorta, dyspnoea or pain may be temporarily relieved by abstracting eight or ten ounces of blood.
6. In extreme dilatation of the right heart in croupous pneumonia due to obstruction in the pulmonary circulation, removal of twenty or twenty-five ounces of blood may greatly relieve, even save life.

Bear in mind that a weak radial pulse under these circumstances is no contra-indication, rather the one, plain signal to relieve the overburdened heart. Cardiac thrombus forming in the heart while dilatation is at its maximum may bring about death prior to the bloodletting.

Also, the myocardium may have become so degenerated that death occurs about the time of the venesection. This should be no good ground for denying the patient the one possible means of relief. Venesection should be performed as soon as the early symptoms of right ventricular dilatation are observed. In apoplexies, phlebotomy may so lower vascular tension as not only to save life but to save reason also.

²³ Paper read before the American Therapeutic Society, May 7, 1908.

THE PROPHYLACTIC TREATMENT OF RHEUMATISM

BY N. S. DAVIS

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IT is surprising that medical men became convinced as slowly as they did that articular rheumatism is an infectious disease, although that this is true has been argued for many years. Since its infectious nature has been admitted the search for an infecting microbe has been persistent. It is to be hoped, and it seems probable, that the coccus isolated by E. C. Rosenow, of Chicago (*Journal Am. Med. Ass.*, April 19, 1913, p. 1223), is the one sought for, occupying a position as regards virulence in warm-blooded animals between *S. viridans* and *S. hemolyticus*.¹ However, before this organism was found it was well known that rheumatism was caused by infectious agents entering the blood at various points or foci. Many years ago I began to impress on students the probability that the infectious agent of acute articular rheumatism gained entrance through some part of the alimentary tract, perhaps the tonsils. I based this view upon the well-known clinical fact that tonsillitis, often mild, preceded the onset of rheumatism with great frequency, and with even much greater uniformity a disturbance of digestion, producing a coated tongue and often foul breath, mild gastric distress, and a tendency to constipation, was a forerunner. It is possible that these latter disturbances create a susceptibility to infection by the specific microbe.

Undoubtedly, as a close study of these cases recently made by many clinicians has shown, the tonsils are the path of entrance of the infecting organism, even when themselves not sufficiently affected to make the patients conscious of their condition; but the tonsils must not be regarded as the only focus of infection, rather as the commonest.

Whatever lowers one's vitality,—for example, sorrow, overwork, loss of sleep, overeating, and constipation,—increases one's susceptibility to rheumatism. Exposure to cold and dampness is especially prone to do this, and if such exposure be combined with any of the

¹ Possibly the same as Poynton and Payne's *Micrococcus rheumaticus*.

other conditions enumerated the soil (*i.e.*, the human body) is extremely well prepared for infection by the specific organism.

The tendency of joints after some days of inflammation rapidly to improve is perhaps due to the production of antibodies, not sufficient to immunize the whole system or to destroy microbes at a distant focus of infection, but which promote local improvement. Fresh infection from the tonsils or other foci may cause an arthritis in some other joint in which the same cycle of inflammation and recovery takes place, and in acute cases this process may be repeated many times. Moreover, if antibodies are thus generated and produce a local effect, the latter is merely transitory, for joints are often reinflamed after short intervals. In subacute and chronic cases joints remain persistently affected, but less acutely. If this theory of local immunization be correct, antibodies in these cases are generated too slowly or in too small amount to be effective, and the focus from which the blood, and thereby the joints, are infected frequently causes reinfection.

Whenever a focus is detected in which the infectious agent is likely to be persistent, therefore frequently or infrequently a cause of fresh attacks of arthritis and of endo- and myocarditis, it should be so treated as to remove the infectious matter. If the tonsils are the tissues in which the microbe lingers, they should be wholly enucleated, for, under the circumstances, this is the only way of ridding an individual of the offending agent.

The following cases will illustrate what this operation may accomplish:

A., a man of 40, had acute rheumatism eight years ago, but no return of it until a year ago. The last attack was preceded by mild tonsillitis; the arthritis was subacute, involving few joints, but these persistently for seven months, the heel and instep of one foot being constantly the seat of trouble. At times there was slight swelling of one instep; more rarely the other ankle was temporarily involved. He was not conscious of any affection of the tonsils, but both showed chronic inflammation in the crypts, and the left was adherent to the posterior pillar of the fauces, and formed a pocket containing partly inspissated pus. The tonsils were not enlarged to any extent, and his throat was not sore. There was no cardiac or other complication, and the patient's general health was good.

The left tonsil was removed, and all symptoms of arthritis were

promptly mitigated. Under a local anaesthetic the other tonsil was removed a week later. At the end of the next week he complained only of trifling pain in the instep, and in another week felt well. Several months have now elapsed, and there has been no return of rheumatism.

The case of L. is more striking. He had had attacks of rheumatism for several years. When first seen by me he was confined to bed, was pale and thin, and often slightly febrile. His knees, ankles, elbows, wrists, and finger-joints were all involved, so that to walk or move about was painful and difficult. Motion in all these joints was more or less restricted. His hands and wrists were deformed by swelling, and the former were slightly bent outward. He could not close his fists tightly. His heart was weak and moderately enlarged; the beats varied from 100 to 120. There was a systolic aortic murmur traceable upward to the top of the sternum, less perfectly audible all over the precordia, but not perceptible in the axilla.

There was slight pyorrhœa at the base of a few teeth on each side of his jaw. His tonsils were moderately large, and the crypts showed chronic inflammation, for a drop of pus could be pressed from them, although he was unconscious of any soreness in his throat.

As soon as his condition was improved the tonsils were removed. By the time the soreness of his throat because of the operation had ceased, his joints had improved wonderfully, the soreness was gone, the stiffness much lessened, and there was a greater feeling of well-being than he had enjoyed for a year. His heart was still rapid, but it steadily became slower and stronger, and was ultimately almost normal in size. In a few weeks stiffness and swelling of his joints disappeared, and his hands, which had been much deformed, became normal in appearance.

Treatment for the pyorrhœa was instituted simultaneously with that for his throat. He has now enjoyed good health for months, has gained flesh and strength, and his heart is compensating well.

Such treatment can not remove a valvular heart lesion, but may prevent its aggravation, and make possible compensation by restoring the patient to general good health. Numerous similar cases might be cited in illustration, but these point the lesson as well as many would.

Pyorrhœa alone is frequently a cause of chronic or subacute arthri-

tis, and demands cure if permanent relief of the arthritis can be obtained.

Another common focus of chronic or repeated infection is one or more of the sinuses opening into the nose or nasopharynx. The following is an illustrative case:

D., while on a transatlantic voyage, developed a severe acute coryza which involved the sinuses. Four days after its onset he felt pain in one knee and in several finger-joints. In one maxillary sinus a mild grade of inflammation persisted for six months until ultimately he was operated upon and good drainage permanently established. During this time his finger-joints were constantly more or less swollen, stiff, and sore, one little finger being persistently affected. After perfect drainage of the antrum was established recovery from the arthritis was rapid and permanent.

Miss C., a middle-aged woman with long-standing inflammation of the nasal sinuses, hypertrophy of the turbinate bones and, therefore, imperfect drainage of the sinuses, came to me with swollen knees, fingers, and wrists which were incapacitating her. She did not suffer acutely, but there was more or less pain constantly, and invariably when the affected joints were used. The swelling caused noticeable deformity of the fingers and wrists. Her tonsils and gums were healthy. The condition had been developing gradually for a year or more.

Under medicinal and hydropathic treatment she improved and became more comfortable. At first she would not consent to the needed surgical treatment of her nose, but after several months she had the middle turbinate bone removed from one nostril, and she then began slowly to improve. The turbinectomy did not cure her nasal catarrh, but lessened it, and permitted the more perfect escape of mucus from the sinuses and nose. The arthritis grew better, so that ultimately her hands and knees inconvenienced her little, if any. The deformity of the fingers and wrists was slight; but all the joints were at times stiff and a trifle sore when used. Undoubtedly, if she had consented to have the nasal sinuses opened and more perfectly drained her recovery would have been complete. However, this case well illustrates that much can be accomplished by such surgical treatment in chronic rheumatism.

Chronic cholecystitis is an occasional cause of subacute or chronic

arthritis. I have seen several such cases permanently cured by both medical and surgical treatment of the disease of the gall-bladder. For example, a teacher of middle age, whose fingers and wrists were deformed by considerable swelling which prevented free and perfect movement of the joints, and who suffered from occasional pain and stiffness of the knees and ankles, joint inflammation which had persisted for ten months, showed also the signs of chronic cholecystitis, such as flatulence, distress after eating, and often soreness and pain in the epigastrium and in the gall-bladder. A jarring of the liver referred the pain to the gall-bladder, and percussion over the gall-bladder caused flinching. At times she had a slight rise of temperature of a degree or a little more, but not frequently. No other focus of infection could be found. Dietetic management, promoting free and regular bowel movements, and hot baths and massage relieved the cholecystitis. As it lessened, the arthritis simultaneously improved, ultimately disappeared completely, and has not returned during the two and one-half years which have intervened since she was treated.

Other foci of infection, especially in chronic cases, are tubal and prostatic inflammations. Chronic inflammation of the middle ear is also an occasional cause of rheumatism.

Cases of chronic rheumatism with joints so deformed as to make the patient helpless have been not only relieved but the joints restored to usefulness by locating the focus of continuous infection, removing it, and afterwards hastening the absorption of exudates and rendering the joints mobile by massage and other treatment. Recoveries sometimes seem miraculous when joints which have been almost immovable for a long time become useful after the focus of infection is found and the infecting agent removed.

It must, however, be admitted that in subacute and chronic cases of rheumatism the focus of continuous or frequent infection must be sought, and, when found, such infection prevented if necessary by surgical procedure. The question then naturally arises, Shall the tonsils be removed in acute cases if there is reason to think that infection took place through them? It is true that some who have had an attack of acute articular rheumatism never have a second; but in a large majority of cases repeated attacks, many of them usually mild, are the rule. These can often be prevented by enucleation of the tonsils. I believe it wise to advise patients who have had more than one

attack of articular rheumatism, even if the second be mild, and provided there is sufficient evidence that the tonsils are the probable focus of infection, to have them removed. Moreover, if a patient's heart has been involved, ever so little, during an attack of rheumatism, the tonsils or any other focus of infection should be removed in order to prevent a recurrence of endocarditis and myocarditis. If it is evident that the tonsils are chronically infected it is best to advise their removal even after a first attack of rheumatism to prevent other and perhaps more dangerous attacks. It is questionable whether, in acute cases, tonsillectomy or other focal treatment ought to be resorted to for the purpose of shortening the duration of the disease. I have not tried this treatment, and cannot answer the question.

Rosenow's streptococcus, which produces experimentally an arthritis comparable to that of rheumatism, would, if found in the contents of the crypts of the tonsils or elsewhere, help to decide through what tissue or cavity infection took place, but unfortunately it can not be identified quickly or easily.

Salicylates can not be discarded in the treatment of rheumatism, especially of acute cases, because they are most useful in relieving pain, and seem to be mildly specific for the disease.

Nor can we doubt the efficiency of hot applications and hot baths, this efficiency being doubtless explained by Rosenow's experiment upon frogs. The latter succumb most readily to his streptococcus of rheumatism, less readily to ordinary streptococci, and least readily to pneumococci. The susceptibility of warm-blooded animals is the reverse of this; yet when frogs were kept by Rosenow at a temperature of 37° C. they responded to infection by these organisms just as warm-blooded animals do. Therefore, it appears that his organism of rheumatism flourishes best at comparatively low temperatures, and least at high temperatures. This doubtless explains the increased susceptibility which man displays when he is chilled, and especially when exposed for some time to cold; it also explains the good effect of heat in the treatment of rheumatism, for hot applications to the affected joints are not only comforting in acute rheumatism, but often lessen the pain and swelling of the joints to which they are applied, although they do not materially shorten the duration of the attack. In chronic and subacute cases heat is of undoubted benefit, both when applied locally and generally. Either moist or dry heat may be used beneficially in

these cases. The electric light bath or a hot tub bath for fifteen minutes, followed by rest between blankets and a more prolonged sweat, and later by massage, is surer than any other treatment to hasten absorption of exudates which swell and stiffen joints.

Good hygienic surroundings, rest, if possible out of doors in a genial air, good food, baths when needed, and massage are especially helpful in restoring chronic cases to health after the focus of infection has been so treated as to prevent constant reinfection. In those cases in which joints have been deformed for many months or several years the best hygienic care is necessary, often for months, to insure recovery. Here iron and other tonics are sometimes of use, but fresh air, genial warmth, sunshine, and good food help more than all else to promote recuperation and to produce a cure.

“ IMMEDIATE ” TREATMENT

BY L. D. FRESCOLN, A.B., M.D.

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By this term is meant, not prophylaxis (measures employed to prevent disease), nor immunity, nor the radical cure of a disease already far advanced and holding its victim in perilous clutches, nor yet emergency treatment, as of accidents, but the deliberate grasping of a situation and an effort to do something to relieve it. It is the field of the family practitioner. It necessitates at the outset early and precise diagnosis. It is true, it often partakes of the nature of emergency first aid, but also looks forward to the best interests of the patient in the progress of the case.

Now we are very frequently advised that early in a case “ no treatment at all ” is better than “ masking symptoms ” and confusing an otherwise possibly correct diagnosis. This is sometimes true; but in addition it must be remembered that much valuable time to the patient may be lost by not resorting to measures that tend to ameliorate the gravity of diseases of the general class to which the one in question evidently belongs. It is true that at times we may be in error even as to the class to which this case belongs; so we must advance cautiously and as though with experience.

Let us illustrate in a general way this reaching of a case quickly, instituting some relief at once, and thus lessening the severity of the attack so as possibly to shorten the course and prevent mortality. While lobar pneumonia seems to run a definite course, probably the ravages of the disease and the multiplication of organisms might often be lessened by early phlebotomy and purgation. This sounds like starting therapeutics anew, and beginning with our ancestors. Again, a case of tetanus, seen and actually treated early, has a better chance than the one neglected, while a person really bitten by a mad dog has no chance whatever if he is transported across the country and left there pending an elaborate preliminary report of the findings, instead of being cauterized, injected, and cured! This subject, therefore, as

you will see, bears a close relation to prevention and first aid to the injured, inasmuch as the latter may refer to an individual case with at least a well-directed provisional "snap diagnosis."

How can we apply the principles of "immediate" treatment in practice? Take up briefly the classes of affections which you are liable to meet in your community, and make use of such hospital and laboratory facilities as you may have at hand in order to institute at once the best measures to aid the unfortunate victim. In this community the immediate attack upon a case showing *intestinal* and other evidences of enteric fever will consist in placing the patient in bed at once and withdrawing solid food. This is doing something, and is not overdoing. Moreover, while the patient is in bed he is not suffering seriously from lack of nourishment, and, while he may be losing a little time, he may be saving himself. The "walking typhoid" case is likely to do badly in the end. We need not be overenthusiastic and give every intestinal case a course of calomel, for it is to be remembered that this may do some harm, as in some unsuspected but far-advanced typhoids and in cases of appendicitis that may rupture under it. As a rule, discomfort in the intestines, possibly diarrhoea, distention, typhoid tongue, etc., are in some part prominent enough even at the start to show that the intestines are at fault rather than the lungs, heart, etc. The safest measure to resort to in treating the constipation met with in these cases, we will say at the first visit, is an enema. A temperature of over 101° F. is treated by using the ice-cap. This is true whether the case turns out to be tubercular enteritis, appendicitis, or typhoid. A little salol may do good and works no harm, while the blood is being examined and a positive diagnosis made. Likewise a little cold (or heat) to the abdomen may afford relief. Thus the first visit, though the case be obscure, will have its indications, without risk to the patient, but rather benefit.

We will not here discuss, if the case be found typhoid, how the alkaline tract is to be made acid and how complications are to be anticipated. We may be summoned, however, for the first time during any stage of the disease. For distended intestines use turpentine, turpentine enemas (or asafœtida enemas), turpentine stupes, and hypodermic injections of physostigmine salicylate, gr. $1/30$. If the intestines are tubercular, the nourishment is carefully pushed and regulated, hygienic environment emphasized, and pure bismuth ad-

ministered freely. If appendicitis is present, it is generally soon diagnosed, and an operation performed,—immediately or as soon as preparations are made,—if, hand in hand with the use of the few remedial indications, an immediate diagnosis shows signs of a gangrenous appendix ready to rupture, this being indicated by only moderately high leucocytosis with high polymorphonuclear leucocytosis which increases every half hour.

These points, you see, are based upon reasoning, and may often be brought out at a first visit. We do not know how seriously any case may turn out, and, from this viewpoint, by the use of our good judgment, each case is in its way a sort of emergency calling for action. Further refinements of treatment may be carried out, these depending upon whether there is present the intestinal variety of influenza, or possibly a case of paratyphoid, or a form of enteritis or dysentery (in which case rather prompt treatment is to be instituted, as by the use of castor oil, pepsin, pancreatin, bismuth, sodium bicarbonate, opium, rectal lavage, flaxseed).

If mere general intestinal cramps are encountered, as from indiscretions in diet, ten drops of chlorodyne and a dose of asafœtida will relieve them. Lead colic is ameliorated by dilute sulphuric acid, magnesium sulphate, opiates, and belladonna. If typhus fever is prevalent, we are justified in thinking strongly of the possibility of this serious disease developing, and may accordingly isolate early. Hemorrhages from the bowel are to be controlled by raising the foot of the bed, giving a hypodermic of morphia, and stopping all food by mouth. A complete obstruction of the bowel is generally an operative case, unless, for example, a strangulated hernia can be reduced and relieved at the time by relaxation, posture, morphia, local heat, and gentle taxis.

In addition to intestinal signs, there may be present *gastric* symptoms, or we may have, as we shall see later, the stomach alone apparently involved. A case of cholera may show decided gastric involvement, and the mere fact that we are not used to seeing the disease is no reason why we should disregard it entirely, especially if cholera is about, or we are handling immigrants. If suspected, the case should be regarded as serious, and ordered to be closely watched. Many of the contagious and infectious diseases will, at the onset, show symptoms of gastric disturbance—anorexia, nausea, vomiting, coated and,

perhaps, dry tongue. Do not force these cases to eat and drink. Cracked ice is indicated, rest the stomach from food, the body from any exertion, and meet in any of the various known ways the dreadful discomfort of vomiting. Even if your efforts are not successful, you will perhaps calm the patient's disturbed nervous mechanism. If this vomiting be from a serious and well-advanced appendicitis, by the prompt administration of a little morphine and atropine sulphate by hypodermic you may be able to ease the patient almost at once. Morphine continued, however, will not cure the condition, and will tend to produce more nausea; moreover, the patient, if kept under its influence, may tend to postpone and interfere with an inevitable operation.

Some cases of vomiting, let it be said, are from a bad stomach *per se*, and some are reflex. If we survey the situation, we need not necessarily obscure the symptoms nor impede the clear development of the case by giving certain forms of relief immediately. It is true that, for a while, we may be treating merely a symptom. For this annoying symptom, apart from the operative case, rest in the supine position is to be enjoined, a sedative enema may help, or a counterirritant (as mustard) to the epigastrium; possibly a little brandy, champagne, or aromatic spirits of ammonia will relieve and do no harm. If this distressing act follow anæsthetization, washing out of the stomach is the best procedure. Postoperative distress in general, it may here be stated, often can be relieved by such simple measures as changing the position of the patient, rubbing with alcohol, propping up the buttocks to relieve the back, giving a bit of ice to suck, hypodermics of a small dose of heroin or codein, asafœtida emulsion per rectum, a little tea, etc. Lime water, pure pepsin, peppermint water, cold champagne, or cocaine by mouth, may relieve a very irritable stomach.

Gastritis from acute alcoholism may often be benefited by the early use of apomorphine (gr. $\frac{1}{8}$ hypodermatically). Adopt the procedure that seems most suited to the case, and it may be well to make provision for trying a number of measures. If much acidity is complained of, aromatic spirits of ammonia or soda may give immediate relief, or copious draughts of warm water. Some cases, especially those with belching, may be eased by Hoffman's anodyne.

In advanced cancer of the stomach, opiates are to be used and albumin water. Cocaine, bismuth, *nux vomica*, and peppermint water

will all relieve the pain. If the liver is at fault, nitrohydrochloric acid, calomel, sodium phosphate, and ammonium chloride seem most useful, and it will rest for subsequent visits to determine whether or not some strict dietetic rules or possibly operative measures should be carried out. In a relaxed nervous dyspepsia strychnine by mouth may aid. Small doses of pure bismuth also may be added.

In the vomiting of pregnancy there is a pitiful call for immediate relief. Our "Hospital Notes" tell us that about twenty drops of 1 : 1000 adrenalin chloride, followed by smaller doses, will relieve; likewise bromide, cerium oxalate, ipecac, *ingluvin*, and hydrastin are given. If the patient is apparently suffering from a migraine, aconite, phenacetin, or antipyrine, cocaine, small doses of morphine, or a blister may afford relief until time permits the correction of any eye-strain or other associated etiologic factor.

Distention of the stomach may be relieved by the use of strychnine, animal charcoal, creosote, and brandy. If a case happens to be a chronic one, it is at once put under a course of diet and treatment; sometimes it may be operative. Turpentine internally and turpentine stapes externally may be of avail if there is much distention. It will be observed that in outlining these treatments dosage is not dwelt upon except where best results seem to follow a dose not ordinarily given.

What are we to do if summoned to a case that is vomiting blood or has been recently vomiting the same? The patient is to be propped up in a semi-reclining posture, kept quiet, given tannic acid and ice to suck. Calcium lactate, gelatin, and adrenalin may be given, or serum administered; but these measures generally are to follow the others. This bleeding may be from the stomach or from the oesophagus, as in the case of a cirrhotic liver or malignancy of the oesophagus; it may occur in a young or in an old person, but these points are immaterial so far as the immediate management is concerned, inasmuch as the measures resorted to do not interfere with the future study and handling of the cases. It may be said that we are merely "treating symptoms" and meeting indications that arise, and this is true in so far as we have to meet them; but we are not prevented from taking a broad view of the case and reaching a provisional and possibly a final diagnosis.

If there is a foreign body in the oesophagus, besides placing the patient prone and shaking him so as to try to dislodge it, we may have

to pass a stomach-tube carefully, and give a bulky food, such as mashed potatoes, to carry any small particles down, or we may administer an emetic, such as ipecac. The thing is to do what is indicated. In urgent cases, if pressure shuts off breathing, a tracheotomy may have to be performed.

When called in to see a case with stomach pain, it must not be forgotten that it may be a case of tabes dorsalis passing through a gastric crisis, and we can often readily observe the nature of the disease. Antipyrine seems to be the best drug for such cases. The ordinary aching pain of gastralgia may be treated satisfactorily by the use of a mixture containing in each dose sp. chloroform, m. xv; tr. cardamom, m. xv; tr. capsici, m. v; sp. ammo. aromat., f3i. A similar mixture brings relief to alcoholics, though a hypodermic of apomorphine (gr. $\frac{1}{10}$ or gr. $\frac{1}{8}$) or the use of the stomach-tube may be better. It is well to add to some of these immediate relief measures, and some, indeed, are household possessions and may have been used already.

Hiccough may be most annoying in connection with a full stomach. Musk and belladonna, or it may be Hoffman's anodyne, and, perhaps, a blister, are the best forms of relief.

Sea-sickness (*mal de mer*) is a very uncomfortable sensation, as, indeed, is any nausea, and may become alarming. The sufferer seeks relief at once, and the following remedies may be tried with satisfaction: Chloretone, gr. v. at a dose; a mixture of dilute hydrobromic acid, m. xv, and sod. bromide, gr. xv, in some simple flavor (the so-called "Bon Voyage" mixture); chloralamid and potas. bromide, $\ddot{\text{a}}\ddot{\text{a}}$ gr. xxx in mixt. glycerrhiz. co.; 15 drops of a solution of three parts menthol and ten parts methyl valerianate with a little wine, with instructions to keep the eyes at rest in the open, and sometimes a little calomel and cocaine, all give relief. It is well to have with one tablets of chlorodyne, etc., to give at least temporary relief.

Biliousness may be relieved by a teaspoonful of fluidextract of taraxacum, or by calomel followed by sodium phosphate and an enema; sometimes by a Seidlitz powder, by a large dose of nitroglycerin, or by sodium nitrite, and by a little pure pepsin and nitrohydrochloric acid in mint-water. The pain of gall-stones may be mitigated by hot turpentine stapes and by morphine and atropine hypodermically. Excessive ascites interfering with respiration and heart-action should be reduced by tapping.

In sizing up our patient we may soon discover that the vomiting and, perhaps, the headache are due to renal disorder, and hot digitalis poultices to the kidneys, hot enemata, and such measures will soon give relief.

Let us now turn from gastric manifestations to some of the *contagious* diseases (of which, by way of parenthesis, vomiting may be the first sign and need very little besides bed). In a child who has not had the ordinary exanthems, and who is languid, feverish, and probably chilly, and who may have been exposed to some contagious disease, we look for any early signs, then isolate and give some beginning treatment. It may be the child is developing measles. Keeping him in bed at an even temperature, out of draughts, and trying to regulate his body temperature (tr. aconit., liq. pot. citrat., and sp. æth. nit.) may be the means of preventing bronchopneumonia.

It may be he is developing varicella. The fever mixture will do no harm, but rather good, and keeping him isolated at the time may prevent an epidemic. Or he may be developing scarlet fever, and taking the case in hand at once may save his heart and kidneys. It may be the onset of diphtheria, and if there is evidence do not wait for cultures, but isolate and treat from all standpoints in the best ways known; give your antitoxin and treat locally and generally a diseased throat—a foul coagulation—necrotic mass full of germs. Others exposed may be at once immunized, providing it be considered not too dangerous from anaphylaxis if any are asthmatics. You need not overtreat, but treat. Do not wait for the disease to get beyond the patient and you, too. This is what we mean by "immediate" forms of treatment.

The less common virulent and contagious diseases of this locality, such as smallpox, bubonic plague, yellow fever, etc., we are to be on the lookout for when they are epidemic, bearing in mind the fact that the severity of any disease with fever may possibly be lightened by intelligent care from the very start. Even if we do no more than keep the patient quiet in bed with proper ventilation, restricted diet, ice for fever, possibly starting elimination, antisepticizing the nasal and oral cavities, administering mild febrifuges, and keeping him away from others, these are important.

In a disease such as *malaria*, chills demand attention. When the nature of the case is known, a good dose of quinine before the chill

will give great satisfaction ; but, coming unexpectedly upon such chill, apply external heat by means of hot-water bottles and blankets, give whiskey and aromatic spirits of ammonium ; ammonium carbonate or strychnine may perhaps alleviate.

Erysipelas, when first seen, may possibly be limited by rest in bed, by the ice-cap, by cold antiseptics, as phenol or ichthyl lotions, or by magnesium sulphate saturated solution, and also by a good purge, followed closely by roborant treatment. Painting or injecting the border with carbolic may help to limit the disease.

In tetanus, likewise a serious infection, we must be most prompt in the initial treatment, especially if the incubation period be short, and immediately cauterize, and probably give the first dose of antitoxin intravenously. Large doses of sedatives are given, and complete evacuation of the bowels and dilution of the toxin with sulphate of magnesia is attempted. Sometimes operative measures are resorted to by injecting nerves or the cord, or by amputating members.

Respiratory disorders may generally be recognized early, and here also it is of great importance to give remedial agents and endeavor to ward off or mitigate an attack. While it is true that lobar pneumonia runs a definite course and reaches a crisis, it is a question as to whether or not we cannot lighten an attack and possibly influence a crisis by careful early treatment.

Foreign bodies in the upper respiratory tract generally demand an effort at removal, but care must be exercised lest too great enthusiasm bring bad results. A few cases necessitate tracheotomy ; at least, an effort should be made to secure a competent opinion at the very start.

The various stages of bronchitis are, as a rule, readily reached, and relief is given by such agents as turpentine stapes, heroin, ammonium chloride, creosote, etc. Ordinary colds in the head or acute respiratory infections may be attacked by nasal douching with Dobell's solution, aspirin, calomel, belladonna, or nux vomica, internally, combined with rest in bed.

Acute follicular tonsillitis is generally given immediate relief by clearing out each follicle with silver nitrate solution 40 grains to the ounce, potassium chlorate, and iron gargle, and internally the drugs just mentioned. Quinsy is relieved by heat and iodine externally, a *rhus glabra* gargle used frequently, and, if about ripe, by incision in the proper place of painting, using to clean out the pus a dilute hydro-

gen peroxide wash. Of course, as cases develop, further changes in the measures used at the first treatment are accordingly made, but, as a rule, a clue as to the best immediate step to be taken can be gotten.

Pleurisies and pneumonias, as already stated, are to be attacked from the beginning as though the patient were preparing for a severe infection. Our efforts must be toward depleting a sthenic individual, diluting the toxin, and supporting the system. The dyspnœa of pneumonia may be relieved by oxygen and fresh air. The pain of a pleurisy can be mitigated by blistering or strapping, and sometimes by the use of antiphlogistine, by salicylates, belladonna, turpentine stypes, or opiates in small dosage. Pleurodynia may be alleviated by the use of aspirin internally, and by rubbing the chest with warm soap liniment.

Just how much proper vaccinations, bacterias, phylacogens, and immunizing or curative sera can accomplish largely depends upon the cases selected, the quality and dose of the drug used, and the early period at which it is administered. When we have variola in our midst, vaccination is to be freely practised before it is too late; when we have reason to think that the animal which bit a person shows unmistakable signs of rabies, the Pasteur treatment can not be started too soon, nor should we neglect to cauterize the wound well at once. When there is certain exposure to diphtheria, immunization with diphtheria antitoxin is recommended. There may be those who would recommend the early use of pneumococcic bacterias or curative serum for pneumonia, as well as typhoid bacterins for typhoid, and anti-gonococcic for manifestations of gonorrhœa; but the more standard means of cure are not to be disregarded nor their use postponed in the face of these modern procedures. In other words, it is often wise to resort to several methods where the result of one is uncertain, provided, of course, they do not disagree with one another.

Chronic conditions may give rise to acute complications that demand instant attention. Take the sudden pain, dyspnœa, and shock of an acute pneumothorax due to the rupture of a tubercular area in the lung. We should have with us our hypodermic syringe, prepared to give an injection of morphine. Fluid may be removed by thoracentesis. Strapping may give some relief. Unfortunately, text-books do not suggest all of the commonplace measures that may be tried for relief.

Again, hemorrhage from the lung may vex us. While it is true that in a plethoric person a certain loss of blood may do good by reducing tension, the already exhausted patient we must prop up, give him ice, and apply it over the upper thorax, administer gallic acid, calcium lactate, sodium nitrite, gelatin, oil of turpentine, ergot, oil of erigeron, a hypodermic of morphine and nitroglycerin—whichever of these may relieve the case; sometimes serum injections or transfusion may be resorted to. We need not necessarily try all of these measures when we find the case is responding. Night-sweats are frequently distressing, but, whatever their cause, they may be relieved properly by the use of agaricin, belladonna and camphor, gallic acid, ergot, and by sponging with alum solution.

Now as regards syphilis: we were formerly taught to wait for a secondary eruption to follow a hard sore. Now, in view of our Wassermann and other tests, and recognizing the importance of quick therapy as well as the waste of valuable time, we treat the initial lesion of syphilis by excision, the cautery, or other local measures to kill the spirochaëtae, and most likely at once administer neosalvarsan intravenously. Other venereal conditions likewise demand active treatment by way of careful injections, the cautery, and local measures, as well as the use of internal remedies, thus preventing complications and sequelæ.

The gravity of acute articular rheumatism (or even the more chronic forms), tonsillitis, chorea, lead poisoning, and alcoholism can be realized only when we survey some of their effects, particularly the *circulatory* disturbances. Too frequently we look upon an old disabled heart and vessels as a dilapidated system for which little could have been, or can be, done, but by judicious management much can be done to enhance the victim's comfort and possibly lengthen his days.

A disordered heart may manifest itself in a number of ways—by cardiac cough, cardiac dyspnœa, cardiac vertigo, cardiac vomiting, cardiac œdema, cardiac pain, and tachycardia. These all demand the proper measures for relief. A patient may be drowning in his own stream through an acute dilatation, and yet the pulse be full and rapid; phlebotomy is likely to work magic. Make it a point to look for a cardiac complication when treating an acute rheumatism or follicular tonsillitis; if upon physical examination there is any evidence of a

beginning pericarditis, apply a light ice-bag to the precordium, or a blister, and at first give aspirin freely.

When meeting a mitral endocarditis pretty well advanced, tincture of digitalis seems to be of most service. The amorphous digitalin, gr. $\frac{1}{4}$, given hypodermically and repeated, may tide over a desperate case remarkably well. Those with aneurism should be put to rest and their blood-pressure lowered. In attacks of angina pectoris, chloroform or amyl nitrite may be administered, and remedies of a relaxing character, such as potassium nitrite and, possibly, large doses of nitroglycerin. These latter measures are also likely to relieve the vertigo sometimes accompanying aortic disease, together with a course of calomel and salines. (This dizziness is not to be confounded with that caused by liver torpidity and relieved by taraxacum.) Cardiac dyspnœa is ameliorated by hypodermics of digitalein, spartein, strychnine, and sometimes of morphine with atropine. Propping up in a more comfortable position is also to be recommended. Cases of paroxysmal tachycardia are occasionally encountered, and they are puzzling. If there is no organic heart lesion, it is often best to exercise the patient. Ipecac, strophanthin (which may be given intravenously), and apomorphine are highly recommended. I saw one case relieved by small amounts of brandy.

Turning our attention to *urinary* affections, there are a number of indications pointing toward disorders of this apparatus which need speedy relief. Painful micturition (dysuria and ardor urinae), nephritis colic, urethral discharge, haematuria, renal vertigo, cephalalgia, and coma, all need careful scrutiny. The backache of a lumbago from rheumatism or exposure to cold (relieved by aspirin and massage without soap liniment) should be distinguished from real renal pain which is relieved by complete rest in bed, liquid diet, hot digitalis poultices, diuretics, camphor, and saline enemata. A severe renal colic from calculus demands morphine and atropine hypodermically and the use of turpentine stapes, with early preparations for operative relief. The same may be said of displacement of these structures and ureteral twist accompanied by Dietl's crisis.

A urethral discharge should be carefully investigated at the first visit, and precaution enjoined not to get any of the pus into the eye, lest it be Neisserian, a smear made, and careful internal and local measures started to prevent further accumulation and travelling of

the disease. Here is where prophylaxis plays an important rôle in disease—not only in an attempt to ward off but to prevent complications.

A case of measles is serious in the light of a possible pneumonia; rheumatism as a possible endo- or pericarditis; acute specific urethritis in view of a possible stricture, retention, or blindness. It is wise for one to have ready a sterile catheter in case of urgent need of emptying an over-full bladder; the double elbow catheter of woven silk is often useful for cases of enlarged prostate. For ardor urinæ, frequent micturition, and alkaline bladder irritation, urotropin and salol are useful drugs.

The *osseous* system when diseased frequently needs hospital treatment, though much may be done at the time of injury or beginning disease by way of relief. An improvised board splint and bandages are useful in immobilizing the parts during transference of the patient to the hospital. A tourniquet applied above a dismembered or severely-mangled part is a necessity. For supporting parts and keeping on dressings, adhesive plaster (preferably sterile) should form a useful part of every physician's portable armamentarium.

Nervous disorders are often the most perplexing to start on the right line of treatment, and yet something should be done, and often must be done, toward relieving of these patients. A maniacal case, as likewise a case of delirium tremens, must be restrained and given a sedative hypodermically to keep him from violence; a paranoiac must be kept under careful watch; a melancholic must from the start be kept from committing suicide; yet all of these cases should be handled humanely. An epileptic in a fit should not be simply let alone and disregarded till the fit is over, but the patient should be laid in a decent place, his clothes about the neck and chest loosened, something safe put between the jaws to prevent biting of the tongue, and, if convenient, an antispasmodic (as chloroform) administered to lighten the paroxysm.

Meningitis should not be considered necessarily a hopeless disease, but careful measures instituted toward recovery, such as quiet in bed, ice and leeches to the head, bromides and chloral administered, as also fractional doses of calomel. When there is a case of delirium, do not neglect to caution the attendants lest the windows be opened and the patient jump out. If, after having once seen the case, this is neglected,

remorse may follow. Veronal, morphine, and camphor monobromate are good sedatives for such cases. Patients with much congestion of the meninges or brain may be relieved by leeches, blisters, hot packs, and salines. Cases of neuritis and neuralgia may be benefited by the salicylates, bromides, iodides (and occasionally opiates), and warm mesotan and menthol-lanolin preparations used locally.

Cephalalgia, as already pointed out, can be ameliorated along lines pertaining to its etiology, whether renal, intestinal, menstrual, cerebral, or due to refractive errors. Ammonal (gr. v, repeated), gel-seum, aconite, phenacetin, and croton chloral will prove beneficial. Ammonal seems to relieve various sorts of pain, including ear-ache. A drop of sterile oil with a little laudanum, belladonna, and aconite, hot in the canal, may also give relief, but do not fail to look deep into the canal for a foreign body, and to see the condition of the drum membrane.

Acute glaucoma is one of the eye conditions that must be considered serious, and often as demanding quick operative interference. A more chronic case may for the time be treated with eserine.

Toothache may be stopped by using oil of cloves or a mixture of phenol, camphor, and thymol. Cocaine and creosote should be used with caution.

Epistaxis, it is true, is sometimes checked by the old-fashioned plug of ham-fat in the nares or by cold applications and allowing the high tension to subside; but it is wise to make an examination, and see if you can touch a bleeding branch of the septal artery with crystals of chromic acid, or pack the bleeding surfaces front and back. Spasmodic and inflammatory conditions of the larynx are relieved by moist heat,—turpentine stupes, or the croup kettle with lime, compound tincture of benzoin or oil of eucalyptus, etc.

When called to see a seemingly unconscious patient it may help one to summarize the possibilities by recalling the rule of thumb laid down in the vowel initials, A, E, I, O, and U, standing respectively for alcoholism or apoplexy, epilepsy, insanity or injury to the head, opium poisoning, and uræmia (the last term may include also eclampsia, diabetic coma, and hysteria). An injured head should be shaved and examined at once for depression or signs of compression. Forms of poisoning are to be differentiated among themselves. If possible, try to get a full, reliable history on the spot; look for bottles about the

person ; smell the breath ; look for white eschars of carbolic acid, yellow ones of nitric acid, and black of silver nitrate ; clean out the stomach, if possible, and administer the proper antidotes and supportive measures. Give lime and aromatic spirits of ammonia for acids (including oxalic) ; vinegar for alkaline caustics ; alcohol and sulphate of magnesia for carbolic acid ; permanganate of potash and stimulation for opium ; bromide and antispasmodics for strychnine, atropine, and digitalis ; white of egg and milk for mercury ; ferric chloride and ammonium hydrate for arsenic, and tannic acid for alkaloids.

A host of *cutaneous* diseases are readily benefited by the general practitioner if the affections are properly recognized. Treatment of *crisipelas* should be begun without delay by the use of cold evaporating lotions (as boric acid, ichthyol, sulphate of magnesia, or carbolic solution) and early evacuation of the system, together with tonic measures. Poison ivy dermatitis, likewise, should be treated with mild boric-zinc or phenol lotion. Boils may sometimes be aborted by rubbing ichthyol in well, or by applying boric or salicylic acid or alcohol preparations. *Urticaria* calls for immediate relief, as also all other itching affections, such as forms of *eczema*, *dermatitis herpetiformis*, *lichen planus*, etc. In *urticaria*, calomel, the salicylates, antipyrine, or phenacetin, etc., should be given internally. *Menthol* and *phenol* preparations are to be relied upon largely for local use. *Scabies* should be controlled early with *sulphur*, and with baths properly directed, lest the disease be conveyed to others. *Pediculosis*, *impetigo contagiosa*, *ringworm*, and *molluscum contagiosus* should likewise be immediately treated and safeguarded, lest others suffer.

Infections of the fingers (as by "safety" pins) and other parts of the body should receive immediate treatment to alleviate pain and to prevent them from spreading rapidly over the body. Hot ichthyol creosote applications, poultices for sloughs, and early incision under ethyl chloride will abort them. Severe burns require not only soothing lotions of sodium bicarbonate, normal salt solution, sterile boric ointment, etc., but also, at times, hypodermics of morphine. Burns of the eye demand sterile oil and atropine, or a weak picric acid solution in sterile oil. Bed-sores may at first be hardened by alcohol, formalin, alum, or silver nitrate ; if more advanced, use zinc stearate.

Diseases of women and physiological activities frequently call for immediate attention. An engorged breast needs massage, antiphlogis-

tic measures, and a firm bandage. The vomiting of pregnancy has been discussed above. Prolonged labor-pains may call for stimulation by quinine, whiskey, and exercise; at other times, if the patient is exhausted, for a hypodermic of morphine; and at still other times, if there is obstruction, for operative interference of some kind. Ruptured extra-uterine pregnancy with shock and internal hemorrhage demands quick operative interference. Postpartum hemorrhage and similar complications of childbirth necessitate the removal of clots, uterine massage, and sometimes packing. Puerperal sepsis must be immediately attacked from the van if the patient is to be saved; careful clearing of the uterus, the application of iodine and alcohol within, stimulating measures, normal saline infusion, intestinal evacuation, and, possibly, the free use of sera, if started early, may do much for the patient.

In *children's diseases* and physiologic states it is also important that they be handled from the very start. The new-born babe may need persistent attempts at resuscitation by means of chest movements, alternate hot and cold douches, efforts to hook out mucus, and to get air into the lungs. With a feeding baby that is upset by artificial food which disagrees with it, such food must be at once withdrawn, and something very light substituted until a proper formula is hit upon. Barley-water may do well to start with, and a teaspoonful of castor oil be given; in an infant of only two months it may be necessary to give 2 per cent. of fat, 5 per cent. of carbohydrates, and .25 per cent. of proteid for the first prescription.

In this limited space our endeavor has been to show the importance of doing something for a patient immediately, and that it is not so difficult to lend aid, even in the beginning of an illness. Some of us in this country have found certain measures to be efficacious, and others abroad have hit upon other measures. We are to use with discretion the sum total of this experience. Plenty of physicians are to be had, especially in cities; there are plenty of hospitals, appliances, dressings, and drugs; hence it seems a pity that so many cases should go on to a bad state before the proper thing is done.

Therapeutics

TREATMENT OF THE COMMON POISONS

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PART II.

HAVING discussed in a previous paper the methods of stimulating the vital centres, let us now consider the common poisons with special reference to treatment.

THE ALKALIES

Of these, the most important are ammonia and the caustic alkalies, sodium, calcium, and potassium. Whatever the poison, if taken by mouth, the most important procedure is to empty the stomach. All poisonous alkalies are markedly irritant, and of themselves cause vomiting. This is often but partially effectual in relieving the stomach, and, when possible, it should be washed out with the tube, the wash water containing an acid such as lemon juice or vinegar. The passage of the tube after the œsophagus and larynx have been irritated by an alkali is painful, and there is some danger of perforation. Furthermore, the tube is likely to be not at hand when required.

The oldest and most commonly employed remedy to induce vomiting is a teaspoonful of mustard in a glass of tepid water. This is unnecessarily irritant, and is sometimes followed by considerable inflammation of the nasopharynx. Copper sulphate, in five-grain doses, will produce emesis, but is rarely justifiable save as an antidote in phosphorous poisoning. Zinc sulphate, in a dose of 20 grains, is probably the best emetic we have. If the patient cannot be induced to swallow, $\frac{1}{8}$ to $\frac{1}{4}$ grain of apomorphine may be administered hypodermically. It must be kept in mind that this drug is depressant to the circulation, occasions emesis by stimulating the vomiting centre, and in cases of poisoning by the depressant narcotics is likely to fail. The dose should never exceed $\frac{1}{4}$ grain.

Ammonia.—This is the most common of all the alkaline poisons. It produces a picture of marked gastro-intestinal irritation, with pain, vomiting, and purgation which may at times become bloody, and is followed by general collapse. There may also be present œdema of the glottis with mechanical asphyxia, in which case tracheotomy must be immediately performed. The antidote may be any acid, but it is important that it be sufficiently mild not to increase the irritation. As has been mentioned, lemon juice or vinegar will meet the requirements.

The symptoms that must now be relieved are pain and diarrhoea, both of which may be controlled by hypodermics of $\frac{1}{4}$ grain of morphia sulphate. Local applications to the inflamed œsophagus and stomach by means of egg albumin, mucilage of acacia, or petrolatum liquidum are also of value. Profound shock may follow extreme intestinal symptoms, and must be met by external heat and respiratory and cardiac stimulation.

It will be remembered that ammonia is oxidized in the body and eliminated to some extent by the kidneys as nitric acid, thereby increasing the acidity of the urine, and causing more or less irritation of the genito-urinary tract. As soon as the acute symptoms have subsided, the ingestion of large quantities of water is advisable, as well as the administration of 20 grains of potassium citrate every two or three hours. Erosion of the mucous membrane is sometimes followed by cicatricial contraction of either the œsophageal or pyloric end of the stomach, and this demands forcible dilatation by the œsophageal bougie. The symptomatology of all the alkalies, of which ammonia is the type, is practically the same, as is also the treatment.

THE MINERAL ACIDS

With these, as with the alkalies, the symptoms are the result of profound local irritation, therefore are much alike. The characteristic stains should be recalled to mind: nitric acid produces a deep golden yellow, hydrochloric acid a lemon yellow, and sulphuric acid a deep brown stain.

Baking soda, washing soda, tooth powder, and plaster from the walls all contain some one of the alkalies, and should be at once administered, stirred in water; soda bicarbonate (baking soda) is to be preferred.

Oxalic Acid.—In the form of potassium oxalate this is sometimes used for the production of criminal abortion. It causes a destruction of the blood with lessening of its power of coagulability, and there is usually free hemorrhage from the intestinal tract. The antidote is chalk (calcium) or magnesia.

Mercury.—There are several types of mercurial poisoning, these varying according to the form in which it is ingested. Some individuals are extremely susceptible to mercury. The author has known one grain of calomel, given in doses of $1/10$ grain, to produce marked salivation. A course of calomel should always be followed by a saline. If the early symptoms of salivation have appeared, with tenderness of the gums and teeth and slight increase of the saliva, even though the drug be stopped at once, the symptoms are likely to persist for from one to two weeks.

Treatment of the condition should be by free saline purgation, the use of fairly large doses of atropine, say $1/150$ grain every four hours, and of a mouth wash containing 15 grains of potassium chlorate, one fluidrachm of glycerine, a half ounce of alcohol, and enough water to make one ounce.

The most frequent form of acute poisoning by mercury is corrosive sublimate (mercuric bichloride), which is often taken by mistake, the tablets being white, and resembling many other five-grain tablets. These accidents can be prevented by making it a rule to dispense the bichloride in a three-cornered, dark-colored bottle marked "Poison," and by using tablets which are triangular in shape. When taken by the mouth the immediate symptoms are severe abdominal pain and sometimes vomiting, later free purgation accompanied by agonizing, cramp-like pains in the abdomen, small bloody stools, and strangury.

As the drug is eliminated both by the bowel and kidney, the symptoms of acute toxic nephritis set in. The urine shows albumin, granular casts, and often blood, is of high specific gravity, and continuously diminishes in amount until there is anuria. This nephritis may persist for many days, and is usually the cause of death.

The management is the immediate administration of albumin in large quantities, usually egg-albumin, the evacuation of the stomach, as already outlined, the giving of large quantities of water, free sweating, sometimes aided by pilocarpine, $1/12$ gr. hypodermically, normal salt solution given intravenously or hypodermically. When the

bowel will not retain it, counterirritation over the kidneys by means of a mustard plaster, and a strictly liquid diet.

The treatment of the nephritis following bichloride poisoning offers a most difficult problem, particularly if the amount of urine be so low that it seems necessary to increase the function of the kidney. It was formerly taught that diuretics of the caffeine group were contraindicated because of their irritant action upon this organ. But later studies tend to show that these act by producing a local dilatation of the blood-vessels in the kidney rather than by direct irritation; this is said to be especially true of theobromine. Citrated caffeine or sodium and theobromine salicylate may be given in doses of five grains and potassium citrate in doses of 20 to 30 grains every four hours, the latter causing diuresis by a so-called salt action, that is, as the potassium salt is eliminated through the uriniferous tubules it brings about a hypertonic solution, hence an increasing amount of fluid is drawn into the tubule until the fluid becomes isotonic.

Iodine.—Since iodine is being so largely used to-day as a local antiseptic it is well to mention that it may cause distinct local and systemic symptoms. The familiar iodism with its frontal headache, slight salivation, and papular eruption is usually relieved by the simple stopping of the drug. If iodine has been taken in poisonous quantities by the mouth, starch is the antidote.

Silver nitrate, a superficial, self-limited caustic, seldom causes acute poisoning. It should, however, be borne in mind that when high enemata of silver are given they should be followed by sodium chloride solution, thus forming the insoluble silver chloride.

Copper sulphate is another profound local irritant which causes a comparatively rare form of poisoning. The antidote is yellow prussiate of potash.

THE SYSTEMIC POISONS

Antimony.—In the form of tartar emetic this is used considerably in the home treatment of alcoholism, and subacute cases of poisoning not uncommonly result. It occasions gastro-intestinal irritation with free watery purgation, and profound shock followed by rapid emaciation, due to the great loss of water from the tissues. The antidote is tannic acid. After giving the antidote, treatment is by free stimu-

lation, as already stated, and hypodermoclysis, or, better, intravenous injections of normal saline, the antidote to be repeatedly given.

Lead.—Acute lead poisoning is rather unusual, and generally occurs from the ingestion of the acetate or sugar of lead. The vomitus is usually white, the stools dark or black in color. The salts of sulphuric acid, most commonly magnesium sulphate, act as an antidote and cleanse the gastro-intestinal tract of the poison. If the magnesium salt is not obtainable, zinc sulphate, or even sodium chloride, may be used.

Subacute lead poisoning, or painter's colic, is more common. Lead is so largely used in the arts that one has constantly to be on the alert for cases of poisoning. Painters often eat their meals without washing their hands, and hold one brush between their teeth while using another. Glaziers and decorators of pottery are also liable to be affected.

The symptoms which must be met in painter's colic are marked constipation and extreme abdominal pain radiating around the umbilicus and usually lessened by pressure. The pain is often relieved by full doses of atropine given hypodermically, but morphine is sometimes required. Magnesium sulphate should be administered freely as soon as the paroxysm has subsided. The patient should be instructed to drink large amounts of water and, when possible, to change his occupation, or so to protect himself as to prevent the lead ingestion.

Chronic lead poisoning may simulate almost any of the chronic diseases of the nervous system. The classical case gives bilateral wrist-drop, a blue line on the gum margins, secondary anaemia with basophilic degeneration of the red blood-cells, and decided gastro-intestinal disturbance. We may, however, have a multiple neuritis due to lead, a lead sciatica, a lead meningitis which simulates true epilepsy very closely, or a lead endarteritis.

The most important part of the treatment, as has been stated, is to discover and to remove the source of lead. If there is constipation, the sulphates may be employed, and water should be ingested copiously. The anaemia is best treated by iron in the form of Blaud's pill, and by arsenic as Fowler's solution, the former given 20 to 30 grains per day, and the latter in two-minim doses, increased to the point of tolerance. Of late iron and arsenic have been given hypodermically, iron in the form of the citrates, one grain, and arsenic in the form of atoxyl in

one-grain doses. Strychnia internally is a very useful remedy, and should be pushed to its full physiological limit, as indicated by more or less stiffness of the muscles at the back of the neck, slight twitchings, and increased patellar reflexes. General massage with cacao butter, together with faradism, forced feeding, plenty of fresh air, and gradually increasing exercises, completes the treatment.

Arsenic.—This is one of the most common forms of accidental or criminal poisoning. If the drug be taken in a single large dose, the symptoms may not develop for several hours. They are usually vomiting and free watery purgation which closely resemble cholera. There is profound collapse and thirst. Often a complete remission of the symptoms occurs, and the patient improves for a day or two, then develops signs of nephritis with albuminous urine containing casts and blood.

Chronic arsenical poisoning may show continuous diarrhoea and anaemia of secondary type, and there is a peculiar scaling of the skin, specially noticeable on the hands and feet.

The best known chemical antidote is the freshly precipitated sesquioxide of iron; the official preparation is *ferri oxidum hydratum cum magnesio*. If the above is not at hand, an efficient antidote may be produced by taking the tincture of ferric chloride, and adding magnesia sodium carbonate (washing soda) or ammonia water, filtering through a cloth, and administering the precipitate stirred up in water. This antidote should be repeatedly given for some hours. First of all, the stomach should be emptied and thoroughly washed out with the stomach tube, the water containing some of the antidote. Morphia hypodermically may be used to control the vomiting and diarrhoea. Large quantities of water must be ingested, and the shock treated as already stated. In the detection of arsenical poison it must not be forgotten that the drug can be recovered in the urine.

Phosphorus.—This is a comparatively rare form of poisoning. Locally, phosphorus sometimes causes necrosis of the jaws, and, if the fumes are inhaled, chronic bronchitis results. It also occasions some irritation of the conjunctiva. Internally the drug produces vomiting and purging which are occasionally phosphorescent. The liver becomes enlarged, and subsequently atrophied; the urine shows leucin and tyrosin, and the presence in it of sarcolactic acid is said to be pathognomonic.

Copper sulphate is the best known antidote, but permanganate of potassium is also used. It is well to give five grains of copper sulphate, and to wash out the stomach with a 1 to 500 solution of potassium permanganate.

Phenol.—Carbolic acid causes black stains on the mouth and lips, free purgation and vomiting, abdominal pain, and a peculiar and characteristic smokiness of the urine, associated with profound shock.

The stomach should be washed out with 20 per cent. alcohol, and magnesium sulphate administered in a dose of about one-half ounce. The antidotal power of the sulphates is still somewhat doubtful, but they should be given, as they can do no harm. It is probable that the alcohol has merely the effect of rapidly diluting the acid. The gastro-intestinal irritation should be treated by demulecents.

ALCOHOL

This commonest of all poisons has probably been the subject of more experimental study than any other substance. Out of the mass of evidence certain definite facts become clear; namely, that alcohol is not a true, direct, circulatory stimulant; that it dilates the blood-vessels peripherally; that it is primarily a depressant to the nervous system, acting first on the inhibitory centres and thus allowing the individual to think more rapidly, but really with less accuracy and clearness; that as a food it produces energy when oxidized in the body but performs no part in building body tissues; that save in a few limited pathological conditions it serves no helpful purpose, and is, therefore, essentially in all doses more or less poisonous; and that its long-continued use tends to the production of sclerotic changes in the tissues.

Acute Alcoholism.—Here we have more or less disturbance of the gastro-intestinal tract, incoordination of gait, lessening of the reflexes, flushing of the skin, fall of body temperature, and stupor preceded by an apparent cerebral stimulation. Respiration is slow, and there is dilatation of the pupils.

If the patient can be made to swallow, the ordinary methods of emesis already described may be employed, preference being given to zinc sulphate in 20-grain doses. One is often compelled to use apomorphine hypodermically, $\frac{1}{8}$ grain being usually sufficient. This drug has the one disadvantage of rapid deterioration; when used it

should always be white or of a slight yellow color; if green it has undergone decomposition. It is also more or less depressant, and must not be used with too free a hand. As a rule, it produces vomiting in five or ten minutes, accompanied by free sweating. The nausea may last several hours, after which the patient usually falls into a quiet sleep. Should immediate stimulation be required, the aromatic spirits of ammonia by mouth in half-drachm doses is useful.

The physiological action of strychnine upon the circulation is still a mooted question, as there seems to be discrepancy between the clinical effects and experimental evidence. In the laboratory strychnine shows no definite effect upon the heart; there is merely a slight but steady rise in blood-pressure, which is vasomotor in origin. It is undoubtedly a positive stimulant to the central nervous system, and seems clinically to be of special value in cases of poisoning by alcohol, lead, and tobacco. In the relaxed condition following a debauch it should be pushed in increasing doses to the physiological limit. Elimination must be aided by copious draughts of water, small doses of calomel, $\frac{1}{10}$ grain every half-hour for 10 doses, followed by a half-ounce of magnesium sulphate, with a semi-liquid diet. The anorexia which follows alcoholism is best relieved by the stomachics, such as tincture of nux vomica, 10 minims; tincture of capsicum, 5 minims, and dilute hydrochloric acid, 10 minims, with enough of compound tincture of gentian to make one drachm; this may be given every four hours before food.

Delirium Tremens.—This state, developing in chronic alcoholism after repeated and prolonged debauches, and characterized by great physical depression, hallucinations of terrifying nature, insomnia, and tremor, is often extremely hard to manage. If there is evidence that the patient has been drinking very recently, the alcohol should be eliminated from the gastro-intestinal tract.

The indications are to produce sleep and to stimulate the circulation. Hyoscine, $\frac{1}{100}$ of a grain, is said to be most effective, but this drug is tricky, and at times acts as a stimulus to the brain, and is likely to bring about respiratory depression. Paraldehyde, in doses of two drachms, repeated in one or two hours, is sometimes efficacious. It may be given in the form of the elixir, N.F., the dose being from two to four drachms. It has a very unpleasant odor and taste, but is a useful and apparently harmless hypnotic.

The bromides alone are usually too weak to be of much service.

Combined with chloral they are often valuable, the dose being 20 grains of bromide and 10 of chloral. The latter must be cautiously used because of its direct action as a cardiac depressant. Veronal, in 10-grain doses, the older sulphonmathanum (sulphonal), and sulphonethylmathanum (trional) may be employed as aids to the more powerful remedies, bearing in mind their comparative slowness of action.

Morphine may be used as a last resource, but, because of its lessening of elimination and its tendency to habit formation, it is to be avoided whenever possible. There is still much difference of opinion as to the use of alcohol in these cases; undoubtedly it relieves the symptoms, at least temporarily, but on rational grounds it would seem to be contra-indicated.

Hot baths may aid the action of the sedatives. The depression may be met by the hypodermic use of strychnine and atropine, digitalis internally, and large doses of the fluidextract of ergot, two drachms every two hours. Thus the immediate symptoms may be controlled. Rest and nutrition are by far the most important factors in any permanent relief.

Chronic Alcoholism.—The cure of the alcoholic habit depends primarily on the confidence and coöperation of the patient. Probably in no other condition is a proper suggestive method more effective than in this. But the same appeal will not meet all cases. One man may be profoundly affected and sometimes permanently cured by exciting his religious emotions; another by the physician's assurance that alcohol is producing pathological changes which will soon result fatally; a third may be influenced only by emphasizing his family obligations; a fourth by reference to his neglected business; and a fifth by telling him of the possibilities of alcoholic insanity. It is of paramount importance for the successful management of the chronic alcoholic that the special suggestion likely to be effective in any given case be thought out and utilized.

Next in importance is the recognition of the patient's weakness of will. He must be continuously watched and tactfully led, lest he yield to the alcoholic craving.

Third, is constant mental occupation for the subject. Something must be given him to do during all of his waking hours, and, whenever possible, the work should be congenial and likely to produce a sense of accomplishment.

The ordinary method in many so-called alcoholic cures is to allow
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the subject a liberal amount of alcohol at first, with the addition of tartar emetic, or the use of apomorphine hypodermically, thus associating the unpleasant sensations of nausea and vomiting with the taste of the liquor. In some instances this may be justifiable and beneficial, but only when done under the immediate supervision of the physician. The writer has seen croton oil, in doses of seven minims in capsule, put into the hands of the wife of a patient to be used indefinitely in the treatment of her husband's debauches. The effect upon the gastrointestinal tract can be imagined.

As to the drug treatment, it is fairly well established that atropine in full doses, say $1/100$ grain three times a day, lessens the craving, and that, as before mentioned, strychnine carried to its full physiological limit has a beneficial influence upon the depressed nervous system. It may be given in doses of $1/60$ grain, increasing it $1/60$ each day until slight twitchings of the muscles at night show that the limit has been reached. It is generally conceded that the immediate withdrawal of the alcohol is best. If there is insomnia with extreme nervousness, care must be exercised in the administration of hypnotics, specially avoiding morphine and chloral, which are likely to cause a drug habit, as the alcoholic is very susceptible to the habitual use of other narcotic poisons.

General massage and an easily digestible and nutritious diet, with eight to ten hours a day spent out of doors, complete the treatment.

It is beyond the scope of this paper more than to touch upon alcoholic insanity. After prolonged alcoholism and repeated attacks of delirium tremens, a curious intolerance to alcohol sometimes develops, so that one or two drinks will cause the patient to burst into violent fits of temper. As time goes on the person becomes insanely jealous on the slightest provocation. These fits of jealousy are associated with an impulse to kill. In some instances a man so affected will murder his entire family, and finally commit suicide. In the management of alcoholic insanity institutional confinement is usually a necessity.

In the prognosis we should be extremely guarded. All alcoholics, even after long periods of abstinence, are likely to relapse. The man who habitually drinks moderately is much more easily cured than the periodic debauchee.

Methyl Alcohol.—Wood alcohol is sometimes fraudulently used. It causes symptoms similar to alcohol, but much longer in duration, and

among them permanent blindness is common. Treatment is unsatisfactory; it consists mainly in the use of alkalies, such as carbonate of soda, with evacuation of the stomach and copious sweating.

THE ANÆSTHETICS

No paper on poisons would be complete without a word on the management of accidents during anaesthesia.

Ether and Chloroform.—The action of these is closely allied to that of alcohol. It is quite generally accepted that the anaesthetics depend for their action on their power to dissolve the lipoid substances contained in the cells of the central nervous system, and the greater their solvent power the greater their anaesthetic effect. It is also generally conceded that chloroform is distinctly more dangerous than ether, because of the former's decidedly depressant action on the heart. It has, too, been demonstrated that chloroform sometimes causes death during the first stages of anaesthesia by arrest of the heart's action from pneumogastric stimulation.

The management of such an accident would be by the immediate stopping of the chloroform, the lowering of the head, artificial respiration, the instantaneous use of atropine hypodermically, and, as a last resource, cardiac massage through an abdominal incision, the heart being mechanically stimulated by pressure through the diaphragm. The early signs of the third stage of anaesthesia cannot be too strongly emphasized; the dilatation of the pupil, the rapid pulse, and the sterterous breathing are the most important.

The writer has often known anaesthetizers to give much more of the anaesthetic than was required, their attention being diverted to the operative procedure. It must always be kept in mind that, no matter what anaesthetic is used, the patient's life is, to a certain extent, in danger, and he should be given the advantage of every possible precaution that counts for safety.

Methods for circulatory and respiratory stimulation have been described in our first paper. Respiratory failure is more common than cardiac, with both ether and chloroform. In either case artificial respiration should be resorted to at once, as it will assist the elimination of the anaesthetic through the lungs, and to some extent mechanically stimulate the heart.

So important is the giving of the anaesthetic now regarded that

many surgeons employ specialists in anaesthesia who do no other work. At the Mayo brothers' clinic in Rochester, Minn., at Dr. John B. Deaver's clinic at the German Hospital in Philadelphia, and at many others, the anaesthetizers are exclusively women, and they develop great efficiency in producing surgical anaesthesia with the least possible amount of the drug.

One of the important factors in the use of a small amount of ether is the manner in which the case is handled in the first stage,—that of excitement. If the patient then becomes frightened, much more will be required. The continuous suggestion of sleep in a monotonous, quiet, yet confident tone is helpful. No better measure is known than to have the patient count from the moment the ether is begun; this insures fairly deep inspirations and, in a degree, occupies the patient's mind. He will usually reach from 70 to 100 before consciousness is lost. The anaesthetic should always be given freely diluted with air, and the open method is now preferred to the earlier use of the cone.

Though a familiar fact, it is at times forgotten that very early in the first stages,—before the period of excitement,—there is a short interval of primary anaesthesia in which very brief operations may be performed, and the subject thus spared prolonged narcosis.

After lengthy operations some surgeons give, as a matter of routine, a rectal injection of a pint of black coffee. This is thoroughly rational, because the caffeine directly stimulates the brain, respiration, heart, and vasomotor centres. On the other hand, some operators still insist on the use of alcohol to counteract ether-shock.

So far as experimental knowledge goes, ether and alcohol are almost identical in their action, the alcohol depressing the central nervous system, dilating the peripheral blood-vessels, and having little action upon the heart. From the experimental view-point, therefore, alcohol is distinctly contra-indicated, and clinical evidence of its value must be indisputable if its use is to be justified. Of late years much interest has been manifested in the acetonæmia occasionally caused by chloroform, and apparently due to a general fatty degeneration, particularly of the liver-cells. The case may recover from the anaesthetic satisfactorily, then become wildly delirious, the pulse being rapid and thready, the skin sallow, and the urine loaded with acetone. The treatment can only be by circulatory stimulation and free elimination, as already outlined.

The administration of large doses of the saline cathartics preceding anaesthesia is not nearly so common as formerly. This method of clearing the gastro-intestinal tract is distinctly depleting, especially if the salts are given in concentrated form (hypertonic solution). It also disturbs the patient's rest at night, so that he goes to the operating table with lessened ability to withstand the anaesthetic and the operative shock. In the Mayo Clinic, at Rochester, merely a large dose of castor oil is given the night before an anaesthetic; this results in a free movement in the morning.

The administration of atropine before general anaesthesia is undoubtedly rational. It decreases the secretions of the mouth, stimulates the respiration and the vasmotor centres, and lessens the irritability of the pneumogastric nerve. It is especially valuable where severe cases of goitre are to be treated. The anaesthetizer must always bear in mind the tendency of the drug to dilate the pupil, or he may be unduly alarmed as to his patient's condition.

Morphine in small doses is frequently used in nervous cases, because less ether is then required, but its extremely depressant action on the respiratory centre must not be lost sight of.

It is evident from this discussion that prophylaxis is by far the most important factor in giving anaesthetics. It is because of the increasing diffusion of knowledge concerning the physiological action of these substances given us by Crile and others, and of our resulting improvements in methods, that accidents under anaesthetics are becoming more and more rare.

MORPHINE AND SCOPOLAMINE

The so-called morphine scopolamine anaesthesia has but a limited value. There is no known physiological difference between the action of scopolamine and hyoscine. They appear to be exactly similar alkaloids, except that one is obtained from scopolia and the other from hyoscyamus, consequently all the characteristic dangers of hyoscine are present, combined with the depressant action of the opium on the respiration. It possesses the further disadvantage of slow elimination. When the volatile anaesthetics are used and the patient passes into shock, the ether or chloroform is somewhat rapidly eliminated; but when morphine and scopolamine have been given hypodermically and it is found the depression is too great, it takes many hours to get the

drug out of the system. It has the one great advantage of relieving the distressing symptoms of the first twenty-four hours after an operation, but it must be conceded to be more dangerous than the older anaesthetics.

PICROTOXIN

A principle in the *Cocculus indicus* (common name, fishberries) is interesting as a poison, because the substance is employed as the active ingredient in so-called "knock-out drops."

The symptoms are vomiting, salivation, depression of the circulation, stupor, and sometimes convulsions.

The treatment is to empty the stomach, to stimulate the circulation, and to control the convulsions, if possible, by large doses of bromide, avoiding the use of chloral and chloroform on account of their depressant action on the circulation.

VERATRUM VIRIDE

This is comparatively little used in medicine at the present day. It causes profound circulatory depression and muscular weakness. The fact that the drug itself has a powerful emetic action, so that large doses are at once ejected, makes cases of serious poisoning rather rare. The treatment consists of the emptying of the stomach and the giving of large quantities of tannic acid.

Lobelia also occasions profound collapse and often emesis. The treatment is like that for veratrum viride.

CONIUM OR HEMLOCK

This drug causes a powerful motor-nerve paralysis, with great muscular weakness, often ptosis of the eyelids, and dilatation of the pupil. The treatment is exactly the same as of veratrum poisoning.

GELSEMIUM

This occasions no eye symptoms, but there is said to be a dropping of the jaw.

NUX VOMICA

Strychnia poisoning is fairly common; the drug is often used to kill animals and, therefore, is easily obtained. It is quite frequently

the means of suicide. The most important symptom is a sudden convulsive seizure, the subject remaining conscious. The convulsion is brought on by the slightest external stimulation, the muscles of expiration and of inspiration being simultaneously contracted, and the chest held as in a vise. A condition known as "cramp-asphyxia" is thus produced.

In this form of poisoning, all emetics and every form of irritation must be avoided. The patient should inhale amyl nitrate or chloroform, and while under the influence of the latter an injection of 20 grains of chloral and 30 grains of sodium bromide may be given by rectum. Hypodermics of nitroglycerin, $1/100$ grain, may be helpful.

When the convulsions are completely controlled, the stomach tube may be passed, and the gastric contents washed out with water containing tannic acid. The patient should be secluded, as far as possible, from all noises and causes of excitement.

BELLADONNA

A number of solinaceous alkaloids, of which atropine is the most important, are used in medicine, all of which, save hyoscine, produce practically the same symptoms and call for the same treatment. Poisoning by these substances is rarely fatal. The chief symptoms are dilatation of the pupil, marked flushing and dryness of the skin and throat, rapid beady pulse, and delirium. The treatment is by means of tannic acid and the bromides. Theoretically pilocarpine in doses of $1/12$ grain, and physostigmine, $1/50$ grain, may be used because of their physiological antagonism.

COCAINE

Acute poisoning by this substance is most frequently the result of its hypodermic use or of its local application to the mucous membranes.

The drug is used very freely by rhinologists, and the writer has often seen distinct cerebral excitement produced by it during operations. In rare cases it produces sudden convulsions, and there is sometimes evidence of profound depression. Cocaine is sometimes used in pure crystalline form. This strength is unnecessary and dangerous. A 4 per cent. solution will usually cause sufficient anaesthesia. It is said that the amount given should not exceed a half grain. In cases

of excitement treatment is by the free use of the bromides and absolute quiet, when the symptoms will subside of themselves. Cocaine is largely taken as a habit drug, and the most common method is by snuffing it up into the nostrils. The likelihood of habit formation is so great that this substance should never be prescribed to be handled by the patients themselves. It causes a feeling of exhilaration, but the *habitué* loses all sense of responsibility, his moral standards deteriorate, and his word can never be trusted. The treatment is largely that of chronic morphinism, which will be later described.

PRUSSIC ACID

This is a fairly common form of poisoning. Unless the antidote be at once given it will be of little value. The symptoms are largely due to asphyxia, being marked cyanosis, bulging of the eyeballs, and bloody froth at the mouth, and asphyxia is the immediate cause of death. The most valuable antidote is probably hydrogen dioxide. The salts of iron are also used, forming ferrocyanide. The drug is rapidly destroyed in the body, and, if it does not soon kill, the case is likely to recover. The immediate administration of the antidote and the prompt resort to artificial respiration, as previously outlined, are about all that can be done.

NITROBENZENE

This, which is the artificial oil of bitter almonds, is largely used as a flavoring vehicle. The symptoms are like those of prussic acid, but less severe. There is no known antidote. The treatment is by stimulation of the circulation, being careful to avoid alcohol, as it increases absorption. The stomach should be immediately evacuated.

MUSHROOMS

In this country most cases of mushroom poisoning are due to the *Amanita phalloides* (deadly agaric). The symptoms, which may not appear for some hours, are prostration, stupor, at times delirium, convulsions, cyanosis, jaundice, and haemoglobinuria. The handling of this poisoning should be by the emptying of the stomach, but a hypodermic injection of apomorphine, with 30 grains of tannic acid given by the mouth, and, as a physiological antidote, $1/50$ grain of atropine sulphate.

ACONITE

The symptoms are those of collapse, numbness and tingling being characteristic. In the treatment, stimulate the circulation and respiration as above, giving tannic acid as the antidote.

DIGITALIS

Because of the very slow absorption of this drug it seldom causes acute poisoning. The immediate evacuation of the stomach and the administration of tannic acid are practically all that is required. The cumulative action of digitalis should be borne in mind when giving the drug for therapeutic purposes. It is well known that occasionally when the prolonged administration of digitalis has shown no effect toxic symptoms have suddenly appeared. This accident may be avoided by now and then stopping its use for intervals of one week.

OPIUM

Acute opium poisoning produces the familiar picture of contracted pupils, cold, clammy skin, a slow pulse, followed by a rapid heart-rate, marked slowing of the respiration, and profound sleep passing into coma. In the treatment of this condition the stomach must at once be evacuated, and here apomorphine usually fails because of the depression of the centres. Zinc sulphate in 20-grain doses, or, better, the stomach tube, should be used. Every mechanical means must be employed to keep the patient awake. Atropine and caffeine are the most valuable physiological antidotes; the former may be used hypodermically in doses of $1/50$ grain, and the latter in the form of a caffeine sodium benzoate in five-grain doses.

The most recent experimental studies on morphine seem to show that it is eliminated mainly through the bowel, no matter how given. Free purgation with the salines or croton oil is indicated. As has been pointed out in our first paper, life is sometimes saved by prolonged artificial respiration, and all the methods of respiratory stimulation there outlined are applicable in these cases.

Chronic opium poisoning gives the picture of a cachectic individual with contracted pupils who is extremely nervous and imaginative, slovenly in person, vindictive in spirit, possessed with delusions of persecution, and whose word is absolutely unreliable. These symptoms

are especially prominent when the patient has been without the narcotic for a short time, and are at once temporarily relieved by a dose of the drug. In this country morphia is generally taken hypodermically, but is sometimes smoked in the form of the extract of opium, and among the poorer classes paretic fiends are not unusual.

The management of the opium habit consists in the rapid diminution, but not immediate withdrawal, of the drug, by cutting the dose in half each day.

If it has been taken hypodermically, it is well to continue this method, as the psychic effect is helpful. As the drug is withdrawn the victim will suffer from insomnia, great nervousness, and gastrointestinal disturbance. Fresh air and occupation are essential, and suggestion and the coöperation of the patient all-important. The insomnia may be met by paraldehyde, 1 to 2 drachms; hyoscine, $\frac{1}{100}$ grain; veronal, 5 to 10 grains; sodium bromide, 20 to 30 grains, etc.; in other words, constantly change the hypnotic so that, if possible, another habit shall not be formed, and carefully avoid chloral.

The patient can never be trusted alone during the treatment, and even after an apparent cure lapses are common.

CHLORAL

Chronic Chloralism.—The indications are similar to those of opium, and the handling much the same. Circulatory stimulation, particularly with digitalis and strychnia, is applicable.

Acute poisoning by chloral is fairly common and very swift, as the drug is quickly absorbed. It should be met by emptying the stomach, and by respiratory and circulatory stimulation, as described above.

TOBACCO

Nicotine's chief physiological action is paralysis of the ganglion-cells. It is a curious fact regarding this alkaloid that in many individuals no harmful effects can be demonstrated, while in others there is extreme intolerance. Tobacco, when chewed in excess, is often the occasion of chronic gastritis, and in cigarette smokers, especially when the smoke is inhaled, a chronic bronchitis is common. A catarrhal condition of the nasal pharynx is usually aggravated by inveterate smoking. At times tobacco causes definite changes in the nervous system, particularly in the optic nerve, leading to impairment of vision and sometimes blindness. As in all types of chronic poisoning,

the injection of large quantities of water is of great value, thus assisting elimination. Strychnine is said to act almost as a specific, and should be given in full and increasing doses.

THE COAL-TAR ANTIPYRETICS

So much has appeared in the public press of late years on the subject of headache powders that the laity ought to be familiar with their danger. The chief symptoms are a constant sense of chilliness, a rapid soft pulse, and sometimes a bluish color to the skin resembling cyanosis, but due to the presence of methaemoglobin in the blood. The main treatment is by elimination and the stopping of the substance.

The acute shock which sometimes follows a single dose of one of the antipyretics, given when the patient has a high temperature, should make us extremely cautious in their use. In fact, experimental evidence seems to prove that the use of the coal tars in prolonged fevers is contra-indicated, as it changes the set of the thermogenic centre, which, being a protective reaction of the body against toxæmia, should not be interfered with save by the external application of cold.

CAFFEINE

Tea, coffee, and a number of so-called tonic drinks sold at soda-water fountains are the principal sources of caffeine. This drug, being the most powerful brain stimulant known, and by far the most universally used, is sometimes the occasion of obscure nervous affections. The poor woman who is insufficiently nourished and who keeps a pot of tea steeping on the stove, from which she drinks liberally throughout the day; the society woman who takes coffee several times a day and tea at five o'clock; the shop girl who goes to the soda fountain and stimulates her exhausted nervous system by a refreshing and pleasant drink containing three or four grains of caffeine,—any one of these may consult the physician for nervousness, loss of appetite, loss of weight, headache, and insomnia, and, unless the cause be discovered, the patient will not be relieved.

RABBI HISDA'S TREATMENT OF CONSTIPATION

BY DR. C. D. SPIVAK

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THAT intestinal disorders were endemic in Palestine and Babylonia is evident from numerous passages in the Talmud. The Mishna gives a list of various chiefs of departments of the Temple, and mentions the name of Rabbi Ahia as the chief of the department for the treatment of intestinal disorders which frequently attacked the priests (*Shekalim* v, 1). Maimonides, a well-known commentator and physician of the tenth century, explains the prevalence of intestinal troubles among the priests as being due to their scanty clothing (the ritual requiring them to wear only four pieces of thin material) and to their walking barefoot on the moist marble floors of the Temple.

The daily toilet occupied a great deal of the attention of the rabbis. "He who does not respond to the call of nature transgresses the biblical injunction," "Ye shall not make your souls abominable" (*Leviticus* xx, 25, *Makkoth* 16b). As the Jews believed that every individual is surrounded by guardian angels, it was considered a matter of courtesy to the angels to pronounce the following sentence before entering the privy: "Be in honor dismissed, ye honored ones" (*Berachoth* 62b). So much importance was ascribed to the function of defecation that to dream of having had an easement is interpreted as an augury of good luck (*Berachoth* 57a).

As toilet paper was an unknown quantity in those days, many rules were laid down concerning the choice of material to be used for "wiping." The prevalent method was to move the toilet with the aid of three "rounded stones," using first the smallest, the size of an olive, then the second, the size of a nut, and lastly the third, the size of an egg (*Sabbath* 81a). Certain articles were to be avoided lest they injure the anus, as for instance plaster, potter's clay, and a pebble which had been previously used by another (*ibid.*).

As every act in the daily life of the Jew was considered from a religious standpoint and performed solely for the service of the Lord, it was, therefore, incumbent upon every Jew on leaving the privy to wash his hands, and during the act of wiping to recite the following benediction: "Blessed be the Lord, the King of the world, who created man in wisdom and formed in him many openings and channels. It is evident and known before the throne of thy glory that were one of these to remain open or to close life and existence would become impossible, even for a short hour. Blessed be thou, O Lord, who healeth all flesh and who performeth wonders" (Berachoth 60b).

The treatment of constipation received considerable attention. The rabbis advised those who had become obsessed on the subject of their constipation to make an effort not to think of it,—advice more easily given than followed. Rabbi Ashi, on the contrary, believed with modern newthoughtists that the mind has a great influence over the body, and counselled the concentration of one's thoughts upon the act of defecation. Rabbi Hamnuna had faith in physical methods, and recommended rubbing the anus with a potsherd (Berachoth 57a). There is no mention of any medicinal or dietetic treatment.

Rabbi Hisda recommended alternate and repeated standing up and sitting down during the act of defecation (*ibid.*).

The benefit derived from Rabbi Hisda's method is explained upon the following physiological basis: Since in the majority of all cases of constipation the column of fecal matter, as a rule, descends into the lower segment of the bowel, but remains there owing to lack of power of muscular contraction, any physical method which will act as an irritant exclusively or principally upon that section of the bowel will set it in motion. An enema or a suppository represents such agencies for producing local irritation. Straining at stool produces the same effect.

Now, after a certain amount of straining, the column of fecal matter is pushed more or less downward, of which phenomenon every one who will pay attention may convince himself. If, after an "honest" effort at straining, one stands erect, chest raised, hips forward, abdomen retracted, and breathes deeply, the fecal column will

be felt to move upward. By repeating this procedure several times the fecal mass will gradually sink lower and lower, will act as an irritant upon the musculature of the rectum, and the torpidity will thus be overcome.

I have adopted Rabbi Hisda's physical method as an adjunct and part of my routine instructions to my patients suffering from chronic corporostasis, and have found it to succeed in all cases, and to work wonders in quite a number of them. But it requires some effort to stand up and overcome the inertia produced by straining.
Labor omnia vincit.

INHALATION TREATMENT BY A NEW METHOD *

BY HOMER M. THOMAS, M.D.

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SINCE the dawn of recorded medicine inhalants have been in use. Back to the time of Hippocrates we have a history of the use of chlorine iodine, infusions of aromatic herbs, balsamic vapors, turpentine, muriate of ammonia, the steam of escaping sulphur springs, the air of salt mines, and the odors of stables containing cattle; all of these things having been advocated. The belief then was that, inasmuch as many respiratory affections had their inception in the inspiration of some disease germ or by contact with something that produced disease, if this disease could be counteracted by means of some inhalation, it might be controlled. Almost numberless have been the attempts to produce mechanical contrivances that would prove effective in this form of treatment. Some inhalants have been simply of heated water into which was placed some medicament; others involved the principle of thermotherapy, or combined heat and moisture; and again efforts have been made to combine the two.

Inhalation includes (1) thermotherapy, because the inhaled vapors should be warmer than ordinary air; (2) hydrotherapy, because water vapors are inhaled; (3) respiratory gymnastics, because the patient must breathe deeply, and (4) medicinal therapy, when medicated vapors are used.

Being somewhat impressed with the possible value of this form of treatment as a topical application, it was my privilege to present to this society, in 1894, an inhaler which was simply a bottle into which the spray principle was used. The spray produced a mechanical mixture of air and the medicine used, and that in turn was expelled at the top by means of compressed air, and was breathed. Feeling positive that these cooled vapors might penetrate farther than the scientific data of that day led us to believe possible, a series of experiments was instituted, first in guinea-pigs, then in dogs, and finally upon the human subject.

* Read before the Chicago Medical Society, December 3, 1913.

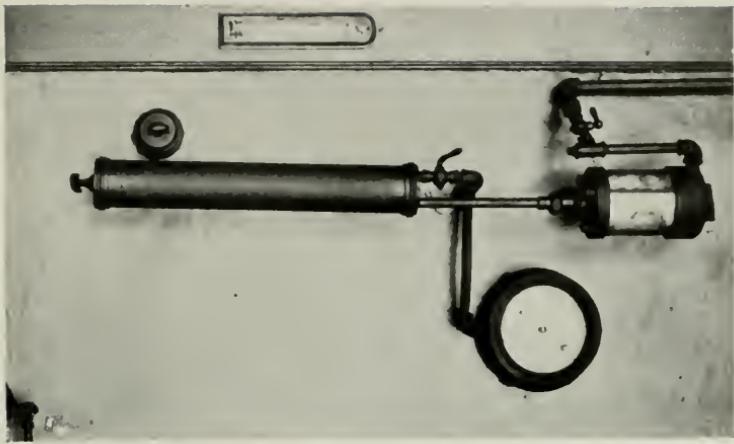
The experiments with animals revealed microscopically the presence of oil globules within the alveoli of the lungs of both the guinea-pig and dog. I was then fortunate in securing at the Cook County Hospital a man as a subject who was dying of secondary anaemia complicated with suppurating tonsillitis, and in whom the respiratory efforts were very strong. I placed over him a curtain that quite effectually prevented the escape of the cold nebulæ, and he inspired it for some twenty minutes. The nebulæ consisted simply of a mixture of lanolin slightly flavored with oil of gaultheria. Shortly afterward he died, and a postmortem examination was made. A small section was cut from the lower lobe of the left lung and placed on a freezing microtome. When ready, sections were made and placed under a high objective. They revealed oil globules within the pulmonary alveoli. Another section of the lung from the lower left lobe was put in osmic acid the following morning, and allowed to remain there 72 hours. Sections were then made by a freezing microtome. They showed well-stained oil globules within the alveoli. These slides were shortly afterward closely inspected by members of the Chicago Pathological Society and afterward presented to this society, and I believe the consensus of opinion was that the presence of vaporized medicaments within the pulmonary alveoli of the human lung had been demonstrated.

This nebulizer was used for some years, but its limitations were recognized. The tendency of nebulized medicaments, when produced in a cool state or at a temperature of about 70° , is to condense within the pharynx and larynx, and, previous to the experiments, it was supposed that they very seldom went lower than the trachea.

Having demonstrated that this form of nebulæ would penetrate to the pulmonary alveoli, it seemed feasible to carry on the experiments in a mechanical way, in order to ascertain whether an instrument could be devised which would combine steam and sterilized compressed air with definite drug medication. In pursuance of this object I present to you this evening the apparatus which has been sketched for me (Fig. 1).

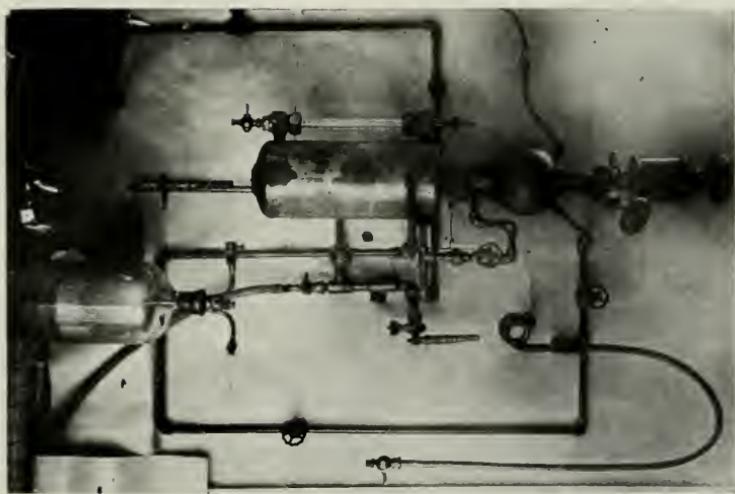
The first part of it consists of a steel boiler into which water is admitted from a pipe that can be connected with the water supply in the office, the water coming into the pipe at the back of a cylinder, and filling it to the bottom of the cylinder. On the side of the pipe is a water gauge which indicates the height of the water within the cylinder.

FIG. 1.



Compressed air sterilizer and gauge.

FIG. 2.



Apparatus No. 2 (perfected).

der. A Bunsen burner is put beneath the boiler and lighted; this produces, as you well know, an intense heat. Then the water begins to boil, as you can see by the bubbles rising in the gauge, and is, of course, too hot for inhalation. The problem then is how to so modify the steam produced as to make it respirable. This is accomplished by connecting the upper part of the steam boiler, and the pipe which contains compressed air at a varying pressure of ten to fifty pounds. At this point the steam and the compressed air unite, and the mixture comes out just above the point where the compressed air enters. The pear-shaped cylinder is made of steel. In this cylinder is a small handful of lamb's wool, and above the cylinder is what is known to mechanics as an oil cup. The oil cup may contain any mixture which is deemed desirable for inhalation. An opening in the oil cup permits one, ten, or thirty drops, as you choose, to pass through the lamb's wool, and to mix with the steam and the sterilized compressed air. You then have in this cylinder a mixture of steam, compressed air, and some definite medication (Fig. 2).

The problem now is how to get this mixture to your patient. A valve which controls the compressed air is then opened. This creates a current which carries the combined air and steam into this cylinder and out. But, at a certain point, condensation and undue heat were feared; and at a previous meeting of the society this bottle was presented as being an effective container for the steam, the medicine, and the sterilized compressed air, and an attachment on the side permits the patients to inhale it. Having a number of times used an undue amount of pressure in such bottle, and having broken several in experimenting, and been obliged to create a number of mechanical controls which were getting out of order, and also finding it difficult to maintain the temperature, an assimilable degree of moisture, and the strength of medicine desired, I finally discarded it; and, as is often the case in experimental work, a simpler method was adopted in the use of the apparatus exhibited.

This, then, is attached at the point indicated, and the mixture is ready for use. The apparatus appears to have the advantage, that, if the temperature becomes too high, or the patient simply stands in front of it and inhales it, he can readily remove himself from it, and not get an undue amount of heat. But another and greater advantage seems to be the fact that when the temperature of the medicine within

the chamber is so volatilized as to produce a vapor, the little bag from which the medicated vapor issues can be placed between the lips, after which the patient is bidden to expel all air from the lungs, to take a deep inspiration by slowly raising the arms, and fill the lungs to the easy capacity of the chest. The breath is held as long as is comfortable for the patient, and then forcibly exhaled. In this way the mixture there appears to penetrate much more deeply than was possible with the apparatus formerly shown.

Inhalation therapy, either by nebulæ or volatilization, is not a curative measure, but sustains the rôle of a topical remedy when associated with other methods of treatment. I believe that it effectively influences diseases of the respiratory passages by modifying various symptoms. The tendency of atomized and nebulized medicines is to condense near the point of inhalation, but in the use of this new apparatus this factor is largely eliminated, and a greater amount of heated medicament is deposited upon the respiratory surfaces. I believe the higher temperature carries a greater quantity of the drugs used into the pulmonary alveoli. Aside from these limitations, there is every reason for its use.

There are marked limitations in the use of anything of a topical nature, but there is also the great advantage that whatever systematic medication may be required in the way of elimination through the skin or bowels or kidneys can be carried on effectively at the same time. We seem to have in this apparatus, under control conditions to the patient, definite drug medication, definite heat production, the conveying of a definite amount of moisture, and a definite amount of pressure for any pulmonary requirement.

The uses to which such an apparatus with medicaments can be applied are numerous. In the nasal passages, when there is no question of removal of bone nor a mechanical condition, but simply an intumescence, and when there is not a true hypertrophy, you secure the free entrance of your medicament through the nasal passages into the post-nasal space, the pharynx, the larynx, the trachea, or into the bronchi. Therefore, the conclusion seems justifiable that in any condition which demands topical application combining the principles of moisture, pressure, definite drug medication, and strength such an instrument has manifest advantages.

A disadvantage would lie in the fact that it can be used only for ambulatory treatment. Of course, it is possible to put such an

apparatus in the home if required, but it would be expensive and difficult.

The apparatus with medicaments can be used in the following conditions: (1) Hemorrhages of air passages, (2) bronchiectasis, (3) acute bronchitis, (4) chronic bronchitis, (5) bronchorrhœa, (6) purulent bronchitis, (7) whooping-cough, (8) acute laryngitis, (9) chronic laryngitis, (10) tubercular laryngitis, (11) pulmonary gangrene, (12) frontal sinus catarrh, (13) ozaena, (14) acute pharyngitis, (15) chronic pharyngitis, (16) pharyngitis siccata, (17) acute coryza, (18) chronic coryza, (19) tracheitis, (20) pulmonary tuberculosis.

The medical substances used for inhalation fall into two groups, according to whether or not they are volatile at ordinary temperature. They may all be used either as moist or dry inhalation; *i.e.*, mixed with water or not. In action they are for the most part stimulant and somewhat antiseptic or sedative. Iodine in concentrated form is a violent irritant, but when well diluted acts as a powerful stimulant, as well as an antiseptic, and, if absorbed, as an alterative and resolvent. It is found useful in some of the chronic forms of bronchitis. For dry inhalation ten drops may be inhaled through a tube or respirator. Iodine is not often inhaled alone, but in conjunction with other drugs of similar action. For moist inhalation the ordinary vapor iodi is used, consisting of one drachm of the tincture with one ounce of water placed in a suitable apparatus and warmed. More often weaker solutions are employed; *i.e.*, half a drachm in half a pint of warm water at about 100° F. Iodide of ethyl (m. x–xv), inhaled from a handkerchief or respirator, is useful in chronic bronchitis, especially the asthmatic forms. It renders the breathing deeper and easier, is somewhat exhilarating, and has no soporific anaesthetic or depressant effect. Containing, as it does, four-fifths of its weight of iodine, it forms a rapid means of saturating the system with this drug.

In cases of bronchitis the following prescription will be found beneficial:

Menthol	grs. viii
Camphor	grs. vi
Eucalyptol	grs. viii
Mixed oils, pine	m. xvi
Oil cinnamon Ceylon	m. iii
Liquid petrolatum and aromatics (double refined)	
q. s. ad.	ʒiii.
M.—Locally.	

Creosote is stimulant and antiseptic; if dry, about ten drops are given for each inhalation; if moist, one to two drachms may be added to the water in a bronchitis-kettle for general medication, or for ordinary inhalation one-half drachm to a pint of boiling water.

As to atomization, nebulization, and sprays, there is no doubt that sprays usually reach only the mouth and pharynx, and that merely a very small part, if any, passes to the larynx. Riegel estimates this as not more than about one-sixth to one-twelfth. If the air tubes be free, the spray may, however, penetrate even to the most distant parts of the lungs, as has been demonstrated by Demarquay (*Gaz. Medic. de Paris*, 1861, p. 616) with inhalations of perchloride of iron, for which he tested with cyanide of potassium. By these means he was able to show the presence of the medicament in the vesicles of the lung, as Lewin ("Die inhal. Therapie," Berlin, 1865) also did in a cavity.

REVIEW OF THE LITERATURE

T. Christen¹ says that inhalation includes (1) thermotherapy, because the inhaled vapors are warmer than ordinary air; (2) hydrotherapy, because watery vapors are inhaled; (3) respiratory gymnastics, because the patient has to breathe deeply; (4) medicinal therapy, when medicated vapors are used.

As a result of the inhalation of heated vapor, an active hyperæmia of the mucous membrane takes place, and subsequently an increased activity of the glands. This increased secretion of fluid helps to remove the tenacious secretion already present, and, perhaps, has also a chemical effect on the pathological products. The deep breathing also helps to remove the secretion, and the effect is greater the deeper the breathing. We can instruct the patient to inspire slowly and expire quickly. In this way the inspiration takes place under lowered pressure, so that during inspiration there is slight venous stasis in the thorax—a sort of passive hyperæmia.

The medicines act by direct contact, disinfecting the pathological secretion and stimulating the diseased mucous membrane; moreover, they are absorbed and distributed to various parts of the body, where they exercise a therapeutic effect. They are combined with CO_2 and given off, sometimes changed and sometimes unchanged. They penetrate to the diseased alveoli, thus coming in contact with the entire

affected membrane and its secretions. Care should be taken not to use vapors too concentrated, as these may cause nausea and other unpleasant effects. The concentration should be constant throughout the inhalation.

F. Diebold² describes and illustrates four inhalers: (1) Sales-Girom; a stream of compressed water is forced against a convex surface or against a second or third compressed stream. In the Wassmuth apparatus three streams at about ten to twelve atmospheres' pressure strike against one another. (2) Matthieu; a compressed stream of water strikes against a column of compressed air at right angles to it. (3) Bergson; a stream of compressed air passes over the opening of a tube standing at right angles to it, carries with it moisture from this tube, and converts it into spray. (4) Reif; a broad stream of compressed air flows from above over the fluid and converts it into a spray. He says all the apparatus are defective because they do not fulfil the following requirements:

- (1) The drops should not be forced in a given direction, but should follow the direction of the inspired air.
- (2) The patient should breathe freely and naturally.
- (3) The inhaled drops should be so small that they can penetrate to the smallest bronchi.
- (4) The drops should contain a definite percentage of the medicine.
- (5) The spray should be kept at a definite temperature.

Since none of these small apparatus fulfil these conditions, Diebold prefers to medicate the atmosphere of an entire room, and keep the patient in it for a varying length of time. The advantage of inhalation is that the vapor penetrates to all parts of the mucous membrane, down to the most minute divisions. Its greatest use is in bronchial affections. It promotes an increase in the secretion, not only while being administered, but throughout the day. It decreases hyperæmia. There is also a biological stimulation of the mucous membrane, and this can be brought about by very weak solutions. Pfuffer, Ahle, and other authors have come to the conclusion that higher concentrations have less therapeutic effect than very weak ones, even those as low as 1 : 100,000.

L. Stefanini³ says the administration of medicine through the inhalation of medicated solutions is generally accomplished by the

use of a strong current of compressed air acting either on the medicines in a powdered form (Bulling's method), or on vapor containing them (Koerting's method). But Koerting's inhaler is somewhat complicated and relatively expensive, and so I have tried to devise an apparatus which could be used either by the individual or to impregnate the air of a whole room with medicated vapor. He does not describe the apparatus, saying he will not do so until later, but describes the experiments he has made in reducing the medicine to its minutest form, and his experiments to show how far they permeate the respiratory tract, and their action on the nasal and laryngeal mucous membrane. No pictures.

Winkler⁴ says that Schreiber's apparatus consists practically of two kettles, one for water and the other for the medicine, which are connected by a small bent tube. The volatile matter in the upper kettle is heated by the water that passes in the form of vapor mixed with the water vapor of the lower kettle through the outlet tube of the upper one. There are also simpler apparatus in the form of a tobacco pipe containing a sponge wet with the medicated solution. Another arrangement, just as simple, is a Wullf's flask, provided with two glass tubes passing through the cork, one reaching down into the fluid, the other shorter, through which the medicated vapor is discharged. Klein's respirator consists of two aluminum plates with a sponge between them on which the medicated solution is allowed to drip.

A practical apparatus is devised by Romkarz. By means of compressed air the medicated solution, which is contained in a flask and heated, is converted into a fine spray. The air pressure drives the vapor against the wall of a bent glass tube with such force that it is converted into a finely-divided spray, and is delivered through the tube into the nose or mouth. The newest apparatus is Koerting's, which, unlike all the others, does not generate vapor, but divides the medicine into the very finest particles, which float in the air in fine flocculi, and are breathed into the smallest bronchiales. This has been particularly successful in salt inhalations, and is also being tried with other medicaments. There are also inhalation cabinets in which the air pressure can be raised or lowered at will. In the next instalment he describes the diseases treated and the different medicines used in inhalation.

In acute and chronic bronchial catarrhs and bronchiastasis, espe-

cially where there is a formation of thick mucus, inhalations of salt solution are very beneficial. Lignosulphate is used in tubercular cases. The natural alkaline sulphurs (as at Aachen, Aix-les-Bains, etc.) are valuable in asthma. Lime water is used in acute diphtheria, croup, and severe angina. Oxygen and hydrogen are used with ozone in especially-constructed flasks in catarrh of the mucous membrane with decomposition, as in diphtheria, syphilis, carcinoma, and advanced tuberculosis. Creosote, guaiacol, benzoic acid, and carbolic acid are used in suppurative bronchitis and gangrene of the lung, also thymol, eucalyptol, formalin, turpentine, and potassium iodide. You should begin with weak solutions, and gradually progress to stronger ones. Among such remedies are the following: Alum, 2 to 3 per cent., in distilled H_2O ; amyl nitrite, 2 to 5 minims, on a handkerchief; benzoic acid, 1 to 10 per cent., or 10 to 15 minims in water in an ordinary apparatus; bitter almond water, 2 to 5 per cent.; boric acid, 1 to 2 per cent.; carbolic acid, .5 to 1 per cent.; chlorine water with equal parts of distilled water; cocaine, .15 per cent.; iron chloride, .5 to 1 per cent.; eucalyptol, .5 to 5 per cent., or oil of eucalyptus 5 to brandy 25, and 170 H_2O , or oil of eucalyptus, spir. vin., 25; oil of juniper, 70, H_2O , 100; solution of formalin, .25 to 2 per cent.; caryophyllum, 10 to 100; glycerine, 10 to 15 M. pure, or 10 per cent.; guaiacol, 2 to 5 M. pure, or 2 to 5 per cent.; potassium chloride, 3 to 5 per cent.; potassium bicarb., 3 to 5 per cent.; potassium iodide, 1 to 2 per cent.; lime water and H_2O , equal parts; cherry laurel, 3 to 5 per cent.; sodium chloride, 1 to 3 per cent., or creosote 20 to 100 per cent., 10 to 20 M. in H_2O , inhaled; menthol, pure, in drops, or 1 to 2 per cent. in H_2O ; lactic acid, 4 to 5 per cent.; morphine, .1 to .3 per cent.; oil emulsion, 5 per cent.; opium ext., .5 to 1 per cent., or simple tinct., 2 to 5 M. in a glass; balsam of Peru, 5 to 15 pure, or equal parts spirits; pyridin, 2 to 5 grammes, or a few drops on a handkerchief; ammonium chlorate, .3 to 1 per cent.; stramonium with potassium nitrate, equal parts, or to be smoked with tobacco or infusion of stramonium, .5 to 1 per cent.; tannic acid, 1 to 2, or tannic acid, 1; glycerine, 50, H_2O , 100; oil of turpentine, pure, in respirator, or 1 to 4 per cent.; thymol, 5 per cent., 10 or 20 M. in H_2O ; infusion belladonna, .5 per cent. These solutions with 100 parts of water can be used in any ordinary apparatus.

A. Harlmann⁵ describes an inhalation mask. It is simply a mask

made of wire netting, fitting over the nose and mouth, with rubber attached to hold it in place. He illustrates it and describes the results of its use with various medicated vapors.

B. Fraenkel⁶ describes and illustrates an apparatus called a halator, which consists of a sheet-iron cylinder with a small kettle inside filled with water. A candle is lighted under the kettle and the water heated to 60° or 70°, which is the temperature at which menthol vaporizes. Instead of a copper kettle I now use one of enamelled iron. The water should not be allowed to boil, as too much vapor is then given off.

Schoenen⁷ says he has used this apparatus in all kinds of lung affections, especially with pine hydrochlorate, which quickly relieves asthmatic attacks. The patient coughs, and thereupon great masses of mucus are discharged. In chronic bronchitis and bronchiectasis abundant secretion is brought about. Other medicines used are menthol, thymol, etc.

Krone⁸ describes the inhalation of salt spray in the neighborhood of large salt works.

A word as to the pathology resulting from the inhalation of vaporized medicines. The inhalation of heated vapor produces an active hyperæmia of the mucous membrane, and subsequently an increased activity of the glands, and this increased secretion of fluid helps to remove the secretion, the effect being greater the deeper the breathing. We can instruct the patient to inspire slowly and expire quickly. In this way inspiration takes place under lower pressure, so that during inspiration there is a slight venous stasis in the thorax—a sort of passive hyperæmia. Hyperæmia of the mucous membrane takes place, and this induces increased activity of the glands. This increased secretion of fluid assists in removing tenacious mucus that is so often present and so hard to dislodge in cases of pharyngeal, laryngeal, and tracheal affections. After the use of this apparatus the patients expectorate masses of secretion which, previous to its use, had been seemingly impossible of dislodgment. Deep breathing helps to remove the secretion, and generally assists in a constructive process.

CONCLUSIONS

It appears to me, as a result of experimental work with the apparatus here exhibited to you, that the following conclusions are justifiable:

- (1) The respiratory capacity is increased.
- (2) The catarrhal condition of the air passages is diminished, thereby promoting the freer introduction of air into the lungs.
- (3) The pulmonary passages are kept in an aseptic condition, and the danger of new bacillary invasion minimized.
- (4) There is marked relief of cough and dyspnoea.
- (5) The alimentary tract is undisturbed by drugs, which gives ample opportunity for the increase of vital resistance by suitable diet and constitutional treatment.
- (6) This treatment by the inhalation of antiseptic nebulæ is rational and practical.
- (7) The new apparatus safely combines steam, sterilized compressed air, and definite drug medication for treatment of the respiratory passages.

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Medicine

THE IMPORTANCE OF FREQUENT AND THOROUGH MEDICAL EXAMINATION OF ALL CITIZENS

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THAT medicine is fast becoming a fundamental social service must be evident to all. The profession in this country is fully acquainted with what is taking place in this connection in Germany and England. In neither of these countries is the profession satisfied with the conditions which have been forced upon it. Like conditions are, in all human probability, coming to the profession in this country. The part of wisdom is for the medical man to become a leader in this movement and so direct it that it will be of the greatest service to both the medical profession and the public. In the general betterment of the race medicine should be the leader. There is no other profession so essential to this movement. The medical profession of the United States has an opportunity to do a patriotic work, which, in my opinion, has never come to any profession, in any country, at any time. Already medical men in every community are rendering a public service, which many of them fail to fully realize and of which the benefactor, the public, is apparently quite ignorant. The doctor, whether he be in country, village, or city, when in charge of any contagious disease does the best he can for his individual patient, while at the same time he renders a much larger service to the community in restricting the spread of the disease.

Measured in any way you please, sentimentally, philosophically, or economically, the service rendered the public in preventing the spread of the infection is of unmeasurably greater value than the cure of the individual. Indeed, should the practitioners in any community fail, for even a few months, to exercise the function of disease restriction, the history of the epidemics of the Middle Ages would be repeated, and there are no blacker records. Even should the practitioners of one busy centre of commerce fail to do their duty to

the public for a short time, not only that city but the most distant parts of our broad land might feel the effects, so close together have all places been brought by modern methods of transportation. Should preventive medicine be paralyzed for one short year, civilization would drop back centuries. Indeed, it is not too much to say that preventive medicine is the keystone of the triumphal arch of modern knowledge, and its displacement would precipitate mankind into relative barbarism. The humblest physician who serves his patient with the agents placed in his hands by scientific medicine renders a broader service to his community.

I have stated that the medical man is often apparently quite unconscious of the great service he is rendering the public, while the laity is often indifferent, or, at least, unappreciative of its value. The training of the medical man has been so exclusively concerned with his relation and his duty to his patient that he himself is almost unconscious of the greater work he is doing in protecting the public. For centuries the chief function of medicine has been to cure disease, and the average physician is slow to realize that the time has come when cure, although still important, has become secondary to prevention. While neither the average medical man nor layman has fully recognized this change, I fear that the consciousness of it is more in evidence outside than inside the profession. The ground for this statement lies in facts observed in the crusade for the abolition of tuberculosis now progressing successfully in every part of the civilized world. Since the discovery of the specific course of this disease by Koch in 1882 the death-rate from it has been reduced fifty per cent. The able statistician of the Prudential Life Insurance Company, Hoffman, finds that had the death-rate from this disease in 1901 continued there would have been 200,000 more deaths from this cause from that date up to 1911 than actually did occur. In other words, the actual saving of lives from death by tuberculosis accomplished in that decenium averaged 20,000 per year. It is true that it will be much more difficult to rid the world of the residual half of tuberculosis than of the first half, but at the end of thirty years, counting from the date of the discovery of the bacillus, we have taken time to look at the results and we find that, measured by figures, the work is half done and that tuberculosis is no longer the "Captain of Death."

The world is indebted to the medical profession for this as it is for the suppression of small-pox, typhus fever, the plague, yellow fever, and other diseases. Medical research discovered the facts and medical intelligence has directed the work, but it must be admitted that a considerable part of the profession has shown but little interest in this, the greatest task ever undertaken by man. This lack of interest is evidenced by the slowness with which the average medical man adopts methods of early diagnosis, still fails to recognize the disease until it is absolutely incurable, and tardily, often unwillingly, complies with the law of notification. These things are quite as true of many a busy city practitioner as of his rural brother; besides, they are as true of the average German or English physician as of his American cousin. Indeed, the inability of the rank and file of the profession in the above-named countries to correctly read the signs of the times is largely responsible for the unsatisfactory condition in which the practitioner now finds himself. It is an undeniable fact that here in our own country many of our profession are not so well posted in hygienic measures as are many of their patients. This cannot long continue without great detriment to the profession. I do not mean to say that the laity can know too much about preventive medicine, but I do mean to say that the physician can know too little about it. I do not for one moment believe that this old wicked world is to be converted into a garden of Eden, free from noxious weeds, blooming with flowers exhaling the elixir of life, parked with trees and shrubs bearing wholesome fruits, and watered with fountains of perpetual youth. Curative medicine has a future which, compared with its past, shall be as the substance to its shadow. We know that a large proportion of the diseases which now afflict mankind is preventable, and the highest duty of the profession is to prevent them. In this way, and in this way only, will medicine win its greenest laurels and best serve the race.

Admitting that preventive medicine is fast becoming a function of the State, and that it is well that this should happen, it should be not only a privilege granted to, but a duty imposed upon, our profession to advise as to the methods to be followed in the administration of this governmental function so as to best serve both the public and the profession, since the interests of both are one. This is a big subject, and I propose in this paper to consider only one phase of it.

I do hope that in this country it will never come to pass that the chief function of the public work done by the medical profession will consist in administering to the indigent sick or to the sick of any class. The object should be the prevention of disease, and this can never be successful until the administration of hygienic measures shall include supervision over all classes and conditions of men. One of the most powerful agents for the advancement of socialism abroad to-day is infection. The millionaire in his palatial residence on the avenue is made to realize that it is not a matter of indifference to him when infection prevails in the tenements. No part of the community tree can be blighted without ill-effect to every other part. Two hundred years ago the philosopher, Descartes, stated that the regeneration of the world must await the development of preventive medicine, and the question now is, Has this science developed sufficiently to accomplish the work for which the world has so long waited?

The special topic in this big and complex problem which I have selected for this present paper is "The Importance of Frequent and Thorough Medical Examination of all Citizens." Preventive medicine will never do its best until it comes to this. We will never entirely eradicate tuberculosis until this is done. Twenty-five years ago the man who said that tuberculosis is a curable disease was looked upon as at least rash and without warrant in his speech, because at that time the profession knew this disease in only its later manifestations. For centuries the medical man could not pronounce an individual tuberculous until cough became persistent, expectoration abundant, emaciation marked, hectic fever pronounced and continued, and night-sweats abundant. These were the cardinal symptoms of "consumption," and without them no one was justified in making a positive diagnosis. The discovery and use of the stethoscope and the fever thermometer added but little to the early recognition of this disease. With the discovery of the bacillus in 1882 came the possibility of an unquestionable diagnosis, but to wait for the appearance of the bacillus in the sputum was to wait too long, and for some years the satisfactory and undisputed diagnosis of this disease, early enough to be of service to the patient, was impossible. Now, with the varied applications of the tuberculin test, the X-ray, more exact knowledge concerning the significance of slight elevations in temperature, especially as influenced by time of the day and exercise, the

importance of slight variations in sound on auscultation and percussion, etc., the competent physician is in a position which enables him to arrive at a positive diagnosis at a time when the patient, following his directions, is quite certain to recover. In this way, as I have already stated, the death-rate from tuberculosis has been reduced fifty per cent. in the past thirty years, chiefly in the last fifteen years, but the other half will need more energetic and different treatment.

In the first place, it must be admitted that there is a considerable part of our profession who are still living in the atmosphere of thirty or more years past. To them the diagnostic indications of "consumption" are those which they learned at the medical school a generation ago. It is more humiliating to add that the professional incompetents are not all gray haired. Indolence, innate stupidity, and lack of all sense of responsibility are not wholly without examples even in the medical profession. However, medical men of this stamp, both old and young, are losing the confidence of their more intelligent clients. The medical profession is not wholly responsible for the failure to recognize all cases of tuberculosis. Many are slow to go to the medical man, and do not do so until it is too late. Before the complete eradication of tuberculosis can be accomplished all citizens must be reached by frequent and thorough medical examination. If the State would fight disease on the sound business principles with which property is protected against fire and other destructive agents, this would be accomplished within two generations.

There have been many computations concerning the financial loss from tuberculosis. One of the most scientific of these is that made by my colleague, Professor Glover, who in 1912 figured the annual financial loss from this disease in each county of Michigan. In making this computation he figured on the deaths from this disease among men only, from twenty to fifty years of age. With the death-rate in that year lower than in any previous year, the cost to the State was one and one-half million dollars. With an annual expenditure of half this amount, properly directed, tuberculosis could be exterminated within the time mentioned above, and the measures resorted to would save at least an equal number of lives from deaths by other diseases. In 1912 the number of deaths from tuberculosis in Michigan was 2615, while that from pneumonia was 2654.

Since 1880 the death-rate from all forms of tuberculosis per one hundred thousand inhabitants in the registered area of the United States has decreased from 326.2 to 149.5. It is well known to workers in the crusade for the extermination of tuberculosis that with every precaution it is well-nigh impossible to prevent the spread of this disease in families in which there is an open case without the removal of this individual.

It must be evident from this, which is practically confirmed by all workers, that the only way to ultimately and thoroughly eradicate tuberculosis is the frequent (yearly) examination of every citizen. The success that may be attained in the restriction of an infectious disease by purely hygienic measures is well illustrated by the decrease in the death-rate from scarlet fever during the past thirty years. Medicinally we probably do not treat this disease more successfully than we did a generation ago. The causative agent has not been discovered. Against it there is no successful antitoxin. There is no specific diagnostic test. Older physicians remember how hopelessly they once contended with this disease and its frequent and disastrous sequelæ.

In 1880 the death-rate from this disease was 54 per 100,000. Within ten years it fell to 13.6, and by 1912 to 6.7. The agents apparently responsible for this decrease are isolation of the sick and disinfection after recovery or death. The relative importance of these measures remains undetermined. The people generally, even the most stupid, became impressed with the seriousness of scarlet fever, and the appearance of the least suspicious rash brings a hurry call to the physician and the isolation of the suspected case. It seems probable that scarlet fever carriers are not frequent.

In contrast with the decrease in the death-rate from scarlet fever, that from diphtheria is interesting. In the census year of 1879-1880 the death-rate from diphtheria was 112.6 per 100,000. In the year 1889 to 1890 it fell slightly—to 97.8. Evidently the isolation and disinfection of that time, so effective in the reduction of deaths from scarlet fever, had but little effect upon diphtheria. During the years from 1890 to 1900, about the middle of which diphtheria antitoxin became available, the death-rate fell in the last year of this decenium to 45.2—less than half. Since 1900 we have had a yearly census, and during this time the death-rate from this disease has gradually decreased, with slight fluctuations, to 18.2 in 1912. Un-

fortunately, we have no reliable morbidity records for either of these diseases, or, indeed, for any diseases. How valuable these would be in the study of the contributing causes in the decrease of the death-rate must be evident.

We are fast becoming conscious of the fact that the combined preventive and curative means at our command are not sufficient to enable us to eliminate diphtheria from the list of uncontrolled infections. Isolation and disinfection apparently have accomplished but little, and the magical curative action of antitoxin, together with its immunizing properties, often fails because employed too late. Recent investigations have surprised us with the demonstration of a large number of diphtheria carriers. Apparently, diphtheria is usually transmitted by those who are, for the time at least, quite immune to the bacilli which they carry. It is too early to predict the result of active immunization with mixtures of the toxin and antitoxin. We are, however, quite certain that the problem of the complete suppression of diphtheria has not yet been solved. Frequent examinations of the throats of healthy school children for the purpose of detecting diphtheria carriers must be added to the duties of the medical inspector, who at present is often doing his work in a perfunctory and inefficient way.

The wide prevalence of typhoid fever remains a national disgrace. It shows how far from a cleanly people we are, because, as some one has said, "typhoid is caused by a short circuit from the anus of one man to the mouth of another." In the census year of 1879-1880 the death-rate from this disease in this country was 34 per 100,000, and twenty years later it was 35.9. Since 1900 it has, on the whole, decreased, but with some fluctuations. In 1912 it reached 16.5. The careless way in which human feces is distributed both in water and on land, by boats, trains, by the pollution of water-sheds, by exposure to flies, by infected milk, oysters, vegetables, and other foods, is responsible for this. It should not be necessary to resort to vaccination for protection against this disease. Many of the cities of Europe have demonstrated that typhoid fever is a disease which can be eradicated by hygienic measures. Here also the carrier has been found to play an important rôle.

While the death-rate from pneumonia (all forms) has shown rather wide fluctuations, there has been no marked or constant decrease since 1880, when it stood at 143.6 per 100,000. During the

next twenty years it increased, and registered 192 in 1900. In 1910 it stood at 147.7—14 per 100,000 higher than it did thirty years before. During these thirty years there are only four in which the death-rate from pneumonia has been as low as it was in 1880. It is therefore justifiable to say that during the past thirty years there has been no advance in either the prevention or cure of pneumonia. Isolation and disinfection have not been generally practised, consequently it is impossible to estimate the value of these measures in this disease.

That the death-rate from cancer in every part of the civilized world is gradually advancing there seems to be no doubt. In this country the advance has been almost constant and continuous from 1880, when it was 42.8 per 100,000, to 1912, when it reached 77. Hoffman estimates the annual number of deaths from cancer in this country at 75,000, and states that this is increasing at the rate of 2.5 per cent. per annum. The increase in death-rate does not equal the increase in prevalence, because an increasingly large proportion of victims are being operated on early and effectively. The increase in malignant disease is fast becoming a menace to the race, and every possible effort should be made to arrest it. Radium, X-ray, and other measures may be of service in the future, but at present there is only one thing—the early recognition and surgical removal, when possible. Every person over forty years of age should hasten to a competent medical man on the first appearance of any suspicious growth. Winter has shown that 87 per cent. of those who apply for treatment were in position to have done so much earlier with a material increase in the chances of recovery. However, it seems somewhat hard when he states: "If the operation is too late, the fault lies with the patient and not with the cancer." The high death-rate from cancer is largely, but not wholly, due to the ignorance of the people. Many cases are inoperable from the start, and some, operable at first, soon (within few weeks) become inoperable. It is impossible to give even a guess as to the number of lives saved from death by early operation. It seems to be well established that if cancer does not return within three years after operation it is not likely to return at all. This is especially true of cancer of the breast, and one is justified in saying that this affliction is curable when the operation is done early and thoroughly.

Many cases of diabetes among elderly people begin in a mild
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glycosuria, easily held in check by proper regulation of the diet. Neglected, the body becomes poisoned and diet has but little or no effect. Many lives might be saved from death by this disease were it the custom for all to secure a thorough medical examination each year. It is becoming quite evident that nephritis, arterial sclerosis, and some forms of heart-disease are due to errors in diet and faulty assimilation of certain foods from the alimentary canal. Frequent examination of all would greatly decrease deaths from these causes. It is unnecessary to multiply examples of the desirability of preventing the development of disease by the frequent examination of all. Medicine will not render its greatest service to the race until this is done.

I do not imagine that this procedure will immediately go into general operation, but we should look forward to its ultimate accomplishment and we should begin to fit medical men for this work. Soon there will be a demand for full-time health officers. This demand will come not only from the cities but from rural districts as well. Already provision has been made for dividing the State of New York into twenty or more sanitary districts with a well-paid, competent man in charge of each and with a State Health Commissioner to direct the whole. The success of this plan has been made certain by the selection of Dr. Biggs as State Director. Similar legislation will be secured in other States, and within a few years a great chance will be given the profession to show what it can do for the welfare of the people in the prevention of disease. These health officials will need laboratories in which hygienic, diagnostic, and investigative work may be done. There will be water and sewage analyses, food and drink examinations, toxicological investigations, urinary, blood, sputum, and other tests to be made. The hygienic supervision of public and school buildings, markets, and places of amusement, etc., will be a part of the work of the sanitary officer. It will be his business to find every consumptive or other infected person, to recognize every case of insanity and mental degeneracy within his jurisdiction. In short, preventive medicine, being for the public good, will become an official function. Ultimately it will come to pass that every citizen will be thoroughly examined at certain intervals, no two consecutive examinations will be made by the same physician, and the result of each examination will be an official record.

THE ULCER SUSPECT

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IN the practice of every gastro-enterologist will be found a certain number of patients upon whose records must be written "ulcer suspect." If the physician is careful, and thoroughly examines each case, thus discovering the one or more factors which arouse the suspicion of gastric or duodenal ulcer, and if he does not make an absolute diagnosis until he feels reasonably sure of his ground, probably about one case to every nine or ten of ulcer will for a time be in this category.

It is, of course, presumably a temporary classification, for often time will clear away the haze and show things in their true light, but for the time being an important question is, Has the patient an ulcer or not? Certain signs and symptoms are present, but others equally important are absent, and after reviewing all the facts in the case we are absolutely unable to decide one way or the other. The patient must be treated, and six months or a year may elapse before an ulcer declares itself.

Perhaps the points which most frequently make one suspect ulcer are hyperchlorhydria or hypersecretion, a positive thread test, occult blood in the stool, and a tender spot. If all of these factors, or several of them, be present simultaneously, there is no doubt of the diagnosis, but not one of them is in itself pathognomonic, albeit very suggestive.

As a rule, these patients are not given the regulation treatment for ulcer by rest in bed, etc., but are put upon a soft and unirritating diet, given general directions and perhaps some bismuth,—in short, an ambulatory ulcer treatment, if there can be said to be such a treatment for out-and-out ulcer.

A certain number of the patients will get well and remain so. We are never sure whether or not they had an ulcer. Most likely the majority had not, although it is by no means hard to imagine a cure in a case of mild ulceration of not too long standing when we consider the improvement that usually follows like treatment in more marked cases.

Other patients will perhaps improve at first, but after weeks or months there will be a fresh outbreak with symptoms more characteristic of ulcer.

Hypersecretion of very acid gastric juice is always a factor to be seriously considered. It is present at times in other affections than ulcer, and may even be a pure secretory neurosis, but it is extremely suggestive of gastric ulcer.

CASE I.—Mrs. S. K. W., aged 57, consulted me December 8, 1912, for symptoms of five years' duration consisting of attacks when she felt as if her heart were crushed in a vise, gnawing in the stomach, headache, canker sores in the mouth, and constipation. There was a history in the past of pain in the epigastrium, extending to the back like a bolt driven through, but having no reference to meals.

Physical examination showed the right kidney enlarged, tender, and movable to the third degree. Slight tenderness was found over the whole right side of the abdomen corresponding to the ascending and transverse colon. There was no localized tenderness, and the splashing sound was obtained over the upper two-thirds of the epigastrium only. No occult blood was found in the bowel movement. Examination of the stomach contents after a test breakfast showed a considerable amount easily obtained, with free HCl 68 and total acidity 94. It was explained to the patient that it was unusual to find such high acidity without some anatomical cause for it, but that nothing could be found. She was put on a diet, given abdominal gymnastics, a cold-towel bath, a tonic, and measures for her constipation advised and immediately began to improve with such rapidity that in a month she said, "I feel like a different person." After feeling well for six months she was suddenly upset by eating strawberries, and had all the symptoms of ulcer, severe epigastric pain a couple of hours after meals, acid regurgitation, tenderness over the appendix and a spot in the epigastrium, occult blood in the stool, and a positive thread test. Diagnosis was made of chronic appendicitis with ulcer of the stomach, and confirmed by operation.

CASE II.—Mrs. I., a widow, aged 40, had had some stomach trouble for years, with alternating periods of euphoria and indigestion; she complained of a gnawing sensation in the stomach, worse when empty, and often waking her at five in the morning. Other symptoms were coated tongue and gas. She was always relieved for a time by eating. She had no cramp-like or colicky pain. Examination showed marked visceroptosis. The stomach was also considerably dilated, covering the lower three-quarters of the epigastrium to three inches below the navel. There was a point of markedly localized but not great tenderness about one and a half inches above and to the right of the navel. The stomach contents showed free HCl 92 and total acidity 100. A benzidine test could not be made for a week because of menstruation starting. She had then improved greatly, and on a meat-free diet the test was negative.

Here we have as factors favoring the diagnosis of ulcer a definite and well-localized spot of tenderness and very high acidity; however, there was no occult blood, and she did so well that she soon reported that she would not know that she had a stomach.

Positive Thread Test.—There have been in the writer's practice quite a few instances of positive thread tests without enough other signs to warrant a positive diagnosis of ulcer. In some of these cases it is almost impossible to believe that they ever had ulcer. This should not be construed to mean that the writer does not consider the thread test reliable; with some limitations he thinks it one of the most valuable means of diagnosis.

CASE III.—Mr. D., aged 21, had complained for some years of dizziness, nausea, loss of appetite, and a depressed feeling, all symptoms being much aggravated in attacks lasting several weeks. He had no pain, and had never vomited.

Physical examination revealed a well-built young man with nothing abnormal to be found. Splashing sound was elicited over the upper two-thirds of the epigastrium only, and there were no tender spots. A test breakfast was refused, but examination of the stool gave a strongly positive benzidine test on regular diet. After a meat-free diet for three days, however, the test was negative. The thread test was strongly positive. Except for one upset about a month later, when he had heartburn, pyrosis, and loose bowels, he improved in every way after regulation of the diet, etc., and has been well for more than a year.

I can not feel sure that this patient had an ulcer, but the thread which was matted with blood has never been explained.

The next case presented symptoms much more clearly pointing to ulcer, but has never had regular ulcer treatment, yet he made an apparently perfect recovery.

CASE IV.—Mr. J. T. R., a farmer, aged 52, consulted me December 6, 1911, for illness of two years' duration. His father had died of tuberculosis and his mother of cancer. His own health had been good all his life. His principal complaints were of gas in the stomach, belching, and bloating. Occasionally he had slight momentary pains through the epigastrium, but very often soreness and a feeling "as if some one were pushing a fist into him."

Abdominal examination showed the recti well developed, panniculus spare, with some bulging in the iliac regions. There was a considerable area of quite marked tenderness in the epigastrium, with ill-defined resistance over it. Splashing sound showed a dilated stomach, extending from up under the rib to the navel. Examination after the test breakfast showed free HCl 45, total acidity of 75, and a faint benzidine reaction in one minute. His stool was mushy and offensive, and on regular diet gave the benzidine test in 7 seconds. The thread test was positive. Subsequent examinations gave two negative benzidine tests on meat-free diet and one faintly positive. His soreness and other symptoms gradually cleared up.

Points favoring ulcer in this patient were (1) occult blood in both stomach contents and stool, (2) positive thread test, (3) epigastric

tenderness and resistance. Yet I could not, taking everything into consideration, make a positive diagnosis.

CASE V.—A. P., a little girl, aged 7, had been troubled with her stomach off and on all her life. When about a year old she had severe attacks of vomiting, even of water, which would last a couple of days and then pass off. Several years ago she had a spell lasting a week. Her abdomen would be swollen, hard, and tender. Her present attack had started three weeks before with pain in the stomach, worse at night. She had no vomiting, but some nausea.

Her epigastrium was hard and tense, with moderate tenderness, most marked at a spot two inches above the navel. The appendix region was normal. Not enough stomach contents was obtained after the test breakfast to make a quantitative analysis, but there seemed to be very marked acidity. The thread test showed a well-marked stain, definitely localized near the pylorus. The occult blood test was negative. She was put on a coarse diet, but with still no occult blood—simply an increase in the soreness, which had almost disappeared under rest in bed with soft diet. Her subsequent history for the past three years has shown no recurrence.

In this patient we had a very definitely stained thread and some other factors favoring ulcer, but such a condition would be most unusual in a child of this age.

CASE VI.—Mrs. F. E., aged 35, had had several slight attacks of stomach trouble during a period of five months. The present attack had lasted but a few days, and was characterized by distress and sharp shooting pains through the epigastrium, worse two hours after meals, and weakness, with bloating and belching. Her pain was more or less transitory,—coming and going. She also complained of a marked choking feeling in the throat.

There was a point of well-localized but slight tenderness one inch above the navel. Splashing sound was obtained over the lower two-thirds of the epigastrium to one finger below the navel. Only three Cc. were obtained after the test breakfast; these contained considerable acid but no occult blood. There was no occult blood in the faeces. Later, occult blood was present and strong on a meat-free diet, but, as the patient's gums bled easily, this may have accounted for it. One thread was positive, one did not pass the pylorus, and a third was negative.

Because of her being a manifestly nervous woman with a *globus hystericus*, much of her trouble was ascribed to reflex disturbance from a lingual tonsil, and this was removed. After some ups and downs she improved considerably on treatment for asthenia with nervous exhaustion, and finally disappeared from observation, so that her present condition is unknown, but her case has always been to me extremely suggestive of ulcer.

The next case is another patient whose symptoms were ascribed to visceroptosis with asthenia and nervous dyspepsia, but in whom the possibility of ulcer was borne in mind.

CASE VII.—Miss E. W., aged 25, an extremely nervous girl, came to see me October 14, 1911, and said that she had suffered for two years with a feeling in

the right side just under the border of the ribs, as if something "were biting or pinching her." She also had occasionally sharp pain, running through from front to back in the mid-epigastrium. She imagined everything from tapeworm to cancer. Her pain had apparently no reference to meals.

Examination showed the right kidney palpable a hand-breadth beneath the costal border. There was slight tenderness over the hepatic flexure and the descending colon, with gurgling on manipulation. There was very slight tenderness in a spot in the mid-epigastrium, but none along the spine. The splashing sound was normal. Her free HCl was 30 and total acidity 50. Benzidine reaction was positive in the stool in 12 seconds. She was not given the thread test at this time, but was treated for the neurotic condition.

One year later, in October, 1912, she was taken with pain in the pyloric region which darted from front to back but seemed to be uninfluenced by food. There also appeared at this time a dorsal tender spot opposite the eighth dorsal vertebra. A thread test showed considerable blood after being *in situ* but three hours. But another made three days later was negative, as was a benzidine test. She then had quite marked tenderness over the appendix.

Under bismuth, belladonna, diet, and the Priessnitz bandage, all her symptoms improved, and she has been better ever since. In this patient there is certainly considerable doubt as to the diagnosis between a pure neurosis, chronic appendicitis, and gastric ulcer.

The next case, I believe, had an ulcer which from time to time seemed about to declare itself unmistakably, but there was just enough lacking to prevent a positive diagnosis.

CASE VIII.—Miss M. M. L., aged 23, consulted me June 5, 1911, complaining of attacks of stomach trouble for four years. She had a weak feeling and a tendency to faint, gas, and some nausea, had lost fifteen pounds, but had no pain.

On physical examination she was found to be a tall, thin woman with enteroprotic build. The right kidney was palpable to the third degree. Splashing sound extended from the upper third of the epigastrium to four fingers below the navel. On firm pressure there was a spot of slight tenderness over McBurney's point. Tapping over the right half of the epigastrium caused a rectus contraction, not amounting to actual muscle spasm. Examination of the stool showed a strong benzidine instantly, and she had a positive thread test. Her free HCl was 42 and total acid 70.

In spite of the benzidine and thread test a diagnosis of ulcer was not made, but was borne in mind together with chronic appendicitis, and she was put on a building-up treatment for her asthenia and visceroptosis. She improved considerably in the next month, but then developed slight epigastric tenderness. A benzidine test at this time gave a doubtful result. She had ups and downs for a year, at times having symptoms more like ulcer, loose bowels, cramp-like pains and soreness in the epigastrium, which, however, would last only a couple of days. Since that time she has been better, but is not strong or robust.

CASE IX.—Miss B. J. A., aged 48, had been ill for six years, and had lost 30 pounds. Her stomach would be upset in attacks. I saw her first in March, 1911. She said that a year before she had been confined to bed several months, having severe pain after eating, and that her bowel movements at that time were

black. Her principal symptoms at the time of examination were dizziness, so severe that it caused her to stagger and several times to fall, headache, nausea, and vomiting. She was afraid to eat, particularly meat. She had marked pyrosis, and bitter, acid regurgitation which would often drool from her mouth at night, and felt like "hot, burning sand." Pain was not then present, but she had formerly had it.

Physical examination disclosed a small, undernourished, sick-looking woman with dark circles under her eyes. There was no tender spot, but faint occult blood in the stool, and free HCl of 80 in the stomach contents, with total acidity of 90. Her blood-pressure was 150 mm. A thread test was returned gory with blood. Later the wash-water from a lavage was returned red with blood. Repeated blood-pressure tests, however, showed marked hypertension, reading as high as 220 mm.

A diagnosis was made of cerebral arterial hypertension. Treatment extending over a considerable length of time resulted in an amelioration of all her symptoms, with a gain in weight from 96 pounds to 118 pounds, her blood-pressure remaining about 170 mm.

This woman's extreme hyperacidity and hypersecretion were probably of cerebral origin, and the blood in her stomach the result of arteriosclerosis of the gastric vessels. Such conditions have been described in arteriosclerosis, but this patient presented so many signs of gastric ulcer that if she had not gotten well her case would have been so diagnosed.

The next case is that of a patient who presented a suspicious ulcer history, together with suggestive findings on physical examination; but, with the more exact tests negative, and as she had marked visceroptosis and asthenia, she was treated for the latter conditions, the possibility of ulcer being borne in mind.

CASE X.—Mrs. M. C., aged 29, a very delicate young woman, had suffered for years with attacks of burning and pain in the epigastrium, closely followed by nausea, with occasional vomiting, she having once vomited blood. The pain came very soon after meals, and was relieved by alkalies or vomiting.

On examination general ptosis was found. There was a point of moderate tenderness in the sternal angle, and another about one and a half inches above and to the right of the navel. There was no tenderness over the appendix or colon. Occult blood test was negative, and she could not swallow the thread. Her free HCl was 42 and total acidity 62.

CASE XI.—Mrs. C. F. was seen with Dr. Gannon on May 17, 1913. For two years she had had attacks, lasting several days or longer, consisting of nausea and vomiting of food taken some time before. There was epigastric pain two hours after eating, with burning and pyrosis. In short, she had all the symptoms of pylorospasm, and once had vomited a slight amount of blood.

Examination revealed a point of moderate tenderness in the mid-epigastrium,

half way between the navel and sternum, as well as slight tenderness over the appendix. There was no occult blood in either the faeces or stomach contents, which showed free HCl 10 and total acidity 30.

Here we have a fairly good history of ulcer and a most suggestive physical examination, but I have considered this a case of chronic appendicitis with referred epigastric pain due to pylorospasm.

The next case to be presented also gave a most suggestive history and physical examination, but other tests were negative.

CASE XII.—Mrs. W. R. M., seen with Dr. Gwynn, had had stomach trouble intermittently for four years and almost continuously for six months. When first taken she fainted, and had loose bowels for a while. She now complained of a pain, cramp-like in character, running through to the back, beginning soon after meals, and lasting until relieved by soda. On an empty stomach she had pyrosis, which lasted until she took food, also acid regurgitation.

The splashing sound was easily obtained to the navel. A spot of quite marked tenderness was found in the epigastrium half way to the navel, but there was also slight tenderness over the rest of the epigastrium, as well as over the appendix, and a spot of marked tenderness to the right of the ninth dorsal vertebra. No occult blood was found in the stool, and the thread test was negative. Free HCl was 38 and total acidity 60.

This patient had pulmonary tuberculosis quite advanced, and her digestive symptoms were ascribed to secondary catarrh, although there is a possibility of a tubercular, or even peptic, ulcer having been present. Her stomach symptoms were unrelieved by soft diet, bismuth, Priessnitz bandage, etc., and she died several months later.

In reviewing the synopsis of these histories it may be that some will say, "Why, this must have been an ulcer!" or "That certainly was not"; but these cases have by no means been cleared up in the writer's mind. By personal contact with the patient an indefinable impression is gained which does not show up on paper, and it is just this thing which enters into the question, and which must be weighed with the factors found on examination.

In this class of patients,—the ulcer suspects,—the diagnosis is a matter of judgment, a careful balancing of points for and others against. None of these patients was radiographed. Such procedure would undoubtedly have cleared up some of the questions; but only in the last few months has our diagnosis of ulcer, unaccompanied by obstruction, been much helped by the X-ray.

The ulcers which probably give us more trouble than any others

are those remote from the pylorus. We are only now beginning to learn the value of the *incisura* in the diagnosis of these cases.

The radiograph will certainly be instrumental in weeding out some of the ulcer suspects, but there will probably always remain a certain proportion in whom a positive diagnosis is impossible. The most that we can say is that, in view of the great prevalence of ulcer, every patient who presents some of its symptoms should be considered a suspect until the possibility of ulcer is ruled out, just as all cases of continued fever are considered typhoid suspects until otherwise proved.

ALIMENTARY TOXÆMIA AND SKIN DISEASES

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WHEN certain individuals of middle age or over consume excessive quantities of proteins,—*i.e.*, larger quantities than they can assimilate and finally oxidize,—a more or less definite set of symptoms appears; viz., headache, drowsiness, lassitude, and irritability. The patient is conscious that his health is not what it once was. His work is a trouble; his memory plays him tricks. His friends appreciate his condition much more clearly than he does, and conclude that he is growing prematurely old. His symptoms are accompanied by abnormal physical and chemical changes in the urine; by physical, chemical, and bacteriological changes in the fæces, and by increased arterial tension.

The urine of such a patient is much more toxic to animals than normal urine; its surface tension is lowered; it contains increased quantities of indol, indol-acetic acid, phenol, skatol, and aromatic oxy-acids—all products of intestinal putrefaction. The ratio of ethereal to preformed sulphates is increased, as is the ratio of ethereal sulphates to total nitrogen. We know that chlorides, phosphates, sulphates, etc., raise the surface tension of urine; that other bodies such as urea, sugar, and albumin act indifferently; whilst aromatic compounds and certain fatty acids depress it. The curve of surface tension runs parallel with the curve of aromatic constituents. The quantity of urine and its specific gravity are variable; frequently they are below the normal.

The fæces may be solid and dry or diarrhoeic. The odor is generally highly offensive. Undigested proteins, carbohydrates, and fats are present in varying quantities. Such stools when examined bacteriologically present a picture sufficiently distinct and constant to be recognized. A carefully-prepared 10 per cent. suspension in normal saline examined microscopically by Gram's method yields a field in which the dominant organisms are *B. aërogenes capsulatus* and *B. putrificus*. A like preparation from the stools of a patient of the

same age in perfect health presents a field in which the dominant organism is *B. coli*. The chemical reaction is alkaline. Phenols may be fractionally separated and estimated. The question now arises, is there a causal relationship between the aromatic compounds of the faeces of this patient and his clinical condition? I hold that there is.

It has been objected that the evidence furnished by experiments on animals is not sufficient to show that indols and other aromatic bodies are toxic. It is further objected that individuals can be found who excrete large quantities of indols and other aromatic compounds conjugated with sulphuric and glycuronic acids, and yet show no toxic symptoms. Such individuals, I answer, completely oxidize their phenols. That the phenols and other aromatic bodies under consideration are produced by the hydrolytic cleavage of proteins through the agency of anaërobic bacteria in the large bowel must now be admitted by all hands. Such products do not occur in the stools or urine of the healthy breast-fed infant whose lower gut is free from putrefactive anaërobies. They occur only in small quantities in the healthy adult. In adults in whom they occur in larger quantities and who suffer from toxic symptoms they can be greatly lessened, and made to disappear by substituting carbohydrates for proteins in the diet for a definite period. The toxic symptoms decline and disappear at the same time. In this, as in all other problems of metabolism, the most important matter for consideration is not what happens in the alimentary canal, nor what bodies are found in the urine, but what is constantly going on in the intermediate body tissues—blood, liver, cord, brain, etc.

The patient suffers because he is unable to oxidize sufficiently the aromatic bodies formed in his large gut through the cleavage of proteins by anaërobic bacteria. It may be that the epithelial cells of his intestinal mucosa are damaged and fail in their antitoxic action; or, being damaged, they let through more toxic material than the other portions of the oxidizing machinery (hepatic cells, cells of the thyroid, cells of the suprarenal, etc.) can deal with; or it may be that still other parts of the oxidizing mechanism are at fault. Here I do not distinguish between reducing or synthetic reactions effected in the cells of the intestinal mucosa, in the liver, and elsewhere, and direct oxidations, as such preliminary syntheses and reductions are necessary stages on the way to final oxidation.

Dogs and monkeys have been injected with indol and phenols and

have failed to show any symptoms of toxæmia. But this does not militate against the fact that such products damage certain men. The oxidizing powers of dogs for these bodies are greater than those of men. Dogs can deal efficiently with the toxins: hence no toxæmia.

The quantity of aromatic bodies in the faeces furnishes no information concerning the work that is being done by the oxidizing machinery. The latter can be measured only imperfectly by the aromatic sulphates and salts of glycuronic acid in the urine. In cases of intoxication we have no means of accurately determining how much of the aromatic bodies are retained and in what forms they are to be found in the different tissues. Some of them can be obtained in phenolic form from the liver. In health the oxidized end-products (aromatic sulphates) in the urine rise and fall fairly regularly with increase and diminution of putrefactive changes in the large bowel. But in the form of auto-intoxication under consideration these sulphates in the urine do not keep pace with the putrefactive processes in the bowel. In such cases, on the substitution of carbohydrate for protein diet, the ethereal sulphates gradually diminish. That in many cases they do not fall suddenly points to the conclusion that oxidation goes on in the tissues after putrefaction has ceased in the gut. Such inability on the part of the oxidizing machinery to keep pace with the formation of putrefactive products is a definite indication for the reduction of protein in the diet. In mild cases vegetable proteins (which yield less phenols than animal) may take the place of animal proteins for a time.

There is a certain analogy between the biochemistry of this subject and that of the putrefaction and oxidation of sewage. As the proteins of sewage pass through the various hydrolytic processes on their way to the formation of amino-acids and ammonia, ever-changing types of bacteria are encountered. When ammonia is to be oxidized to nitrous acid new types of bacteria appear on the scene; and these are superseded by others when the final nitric acid is to be formed. In like manner the chemical characters of different foodstuffs determine more or less sharply the types of bacteria in the alimentary tract. The analogy fails toward the end, as the oxidations of aromatic toxins are affected by oxidases of tissue cells (intestinal, hepatic, etc.) in presence of a limited supply of oxygen; whereas the final stages of oxidation in sewage are completed by bacterial enzymes in the presence of excess of atmospheric oxygen.

It would appear, therefore, that the more this limited supply of oxygen in the tissues is increased and the more the aromatic material to be oxidized is diminished in a case of this trouble, the better, as thus alone can one hope for any degree of completed oxidation. Whether in some cases special forms of acid-producing bacteria should be ingested does not seem to be a matter of primary importance, as carbohydrate dietaries will quickly establish their particular bacterial flora.

Such patients show reaction to certain foods by a skin affection known as urticaria. Others suffer from exudative erythema. Erythema multiforme is mostly toxic in origin. Acne claims a certain percentage of younger patients, in whose lower bowel a larger amount of aromatic cleavage products than normal is to be found.

Perhaps the skin affections most closely related to alimentary toxæmia are the eczemas. Careful examination of fæces and urine, as above indicated, will demonstrate the condition in most eczemas, and will demonstrate it especially in the weeping eczemas of the arms and body in men of middle age who ingest meat in quantity. A milk and carbohydrate dietary, persisted in for eight or nine weeks, will in many of these chronic cases effect a cure.

In most skin diseases, other than parasitic, gastric and intestinal fermentations play a large part; and the more fully this is recognized and acted upon the better for patient and physician.

THROMBOSIS AND EMBOLISM: A SERIES OF UNUSUAL CIRCULATORY ACCIDENTS OCCURRING IN ACUTE INFECTIONS

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THE subject of thrombosis and embolism is closely associated with all diseases of the circulatory apparatus, but it plays an equally prominent rôle in connection with various acute infections, particularly of the septic type.

Having observed a number of rather unusual instances of thrombosis and embolism during the past two years, I have been prompted to collect the essential data peculiar to the series, and present them at this time.

CASE I.—Gangrenous appendicitis; mesenteric thrombophlebitis; pyelophlebitis of the liver; acute endocarditis; and simultaneous embolism of the left middle cerebral and left axillary arteries.

This patient was a young married woman, thirty-two years of age, passing through her second gestation when, at the seventh month, an acute appendicitis developed and necessitated operative interference. A gangrenous appendix with perforation was removed, and was followed two days later by a miscarriage. On the third day following the operation the patient experienced a severe chill, which was followed by a rise of temperature to 102°, and after this for a period of eight days chills occurred daily, each being followed by a marked rise of temperature. A condition of general sepsis soon became apparent; it was accompanied by enlargement of the liver, with distinct localized pain, particularly of the left lobe, and an endocardial murmur, moderate albuminuria, and a polymorphonuclear leucocytosis of 18,000. On the eighth day it was thought by the attending physician that there was a distinct localization of the process in the liver with the formation of an abscess which required surgical treatment. Dr. A. D. Bevan, of Chicago, was called for this purpose, and arrangements were made for having the operation performed on the following morning. During the night preceding the day set for the operation, and while the attendant, Dr. Merrill, was in the room, the two embolic accidents peculiar to this case occurred, apparently simultaneously. While the doctor was seated on the left side of the bed and examining the left radial pulse the patient suddenly became restless, and several jerky movements were noted in the right arm and leg, the head at the same time being drawn toward the left side; there were also some twitching movements of the right side of the face. The breathing became labored, and finally of stertorous character. The attendant became alarmed, particularly as, while palpating the left radial, he noticed that it soon disappeared altogether. His natural thought was that the patient had expired, and he so expressed himself

to the nurse, who was sitting on the other side of the bed, by saying, "The pulse is gone, and the patient is dead." But the nurse replied that the patient had a very good pulse in the wrist that she was palpating, but at the same time she called the doctor's attention to the peculiarly limp character of the right arm and leg, and it soon became apparent that there was a distinct hemiplegia involving the right leg and arm and the lower portion of the right side of the face. Then, in again examining the left arm, it was noticed that there was a distinct pulse in the upper portion of the right axillary space, while there was absolutely no pulse to be detected in the lower right axillary region along the course of the brachial, or in either the radial or ulnar arteries. The patient became unconscious, and remained so during the following day and a half, when she expired. It is needless to say that when the surgeon arrived in the morning for the operation it could not be considered.

The peculiar feature about this case is the apparently simultaneous occurrence of peripheral embolism in the left middle cerebral artery producing right-sided hemiplegia, and embolism of the left axillary artery causing the disappearance of the arterial pulse in the left arm below the point of occlusion. The septic thrombophlebitis which primarily involved the mesenteric veins led to pyelophlebitis and multiple abscess formation in the liver; but the two embolic accidents which were associated with the *exilus lethalis* could best be attributed to an infectious endocarditis which had developed as a feature of the general sepsis.

CASE II.—Suppurative cervical lymphadenitis; operative trauma of left facial artery; embolism of left middle cerebral artery; right hemiplegia.

The patient was a girl, five years of age, the daughter of a physician, who had undergone an operation on June 14, 1912, for the removal of enlarged tonsils and adenoids. About two weeks later a suppurative cervical lymphadenitis developed just beneath the left angle of the lower jaw, and was opened by incision, and drained. It became necessary to do a more extensive drainage operation on August 7, 1912, during which the left facial artery was injured, causing a profuse hemorrhage, which was readily controlled. Twenty-four hours after this operation complete paralysis of the right leg, arm, and lower portion of the face developed, with loss of speech. The patient gradually regained the power of speech, so that at the present time practically no defect can be detected, and the motor disturbance has subsided to such an extent that she walks with only a slight limp, and has good control of the right arm but very little power in the fingers, yet continued improvement seems to be taking place under treatment by a competent orthopadist.

In this instance it is evident that at the time of the operative trauma to the left facial artery infectious particles or emboli were transmitted directly by the arterial current, and lodged in the left middle cerebral artery with the resulting right hemiplegia.

CASE III.—Exophthalmic goitre; acute influenza; chronic infectious endocarditis; embolism with occluding thrombus of the right posterior and anterior tibial arteries with resulting ischaemic gangrene of the right leg.

The patient was a young man, twenty-three years of age, a cook by occupation, who at seventeen and nineteen years of age had had severe attacks of acute rheumatism, which resulted in a chronic valvular lesion affecting both the mitral and aortic valves. About one year before the patient came under observation symptoms of exophthalmic goitre were manifest, and when admitted to the Iowa Methodist Hospital in October, 1911, he presented the clinical picture of exophthalmic goitre. At this time the patient was suffering with broken cardiac compensation, which was relieved by several weeks of hospital treatment. Operative treatment was advised for the exophthalmic goitre, but the patient decided to defer it for a time. After passing through a fairly comfortable winter, in March, 1912, he developed an attack of acute influenza, which confined him to bed for two weeks. After apparent recovery from the influenza, he continued to have daily fever and considerable precordial distress, which was aggravated by exercise. The endocardial murmur became accentuated, and a diagnosis of chronic infectious endocarditis induced by the grippal infection was entertained. About two weeks after he had begun to get about, he was suddenly seized with very severe pain in the right foot, which at first was thought to be a recurrent attack of rheumatism. He was again referred to the hospital. At the time of admission the large toe of the right foot was discolored and swollen, and the entire foot and the lower portion of the leg were exceedingly painful, especially when the limb was not elevated; the pain was so intense that morphia was required almost continuously. An irregular fever with an afternoon rise to 102° or 103° accompanied the illness. During the course of the three following weeks an ischaemic gangrene with some superficial moist necrosis developed, involving the right leg as far as its upper third. As no pulse could be detected below the popliteal artery, an occluding thrombus of the posterior and anterior tibial arteries seemed most logical. Amputation of the limb at the tuberosity of the tibia was performed by Dr. O. J. Fay, and confirmed the location of the occluding thrombi. The patient continued to have a daily fever temperature, and considerable pain in the stump region. The endocardial murmur persisted. A streptococcus was separated from the blood culture, hence the condition of general sepsis associated with chronic infectious endocarditis evidently remained, and gradually produced such exhaustion that the patient succumbed on May 20, 1912. Unfortunately, an autopsy was not permitted.

As has been observed in other acute infections occurring during conditions due to the existence of exophthalmic goitre, in this case the symptoms of hyperthyroidism entirely disappeared during the last illness.

CASE IV.—Acute tonsillitis; thrombosis of the left posterior tibial artery; ischaemic gangrene of the left foot and leg; embolism of the right middle cerebral artery; partial left hemiplegia; exitus.

This was a recent example in the series, and occurred in a man, thirty-nine years of age, a school superintendent, who was admitted

into the service of Dr. A. C. Page, at the Iowa Methodist Hospital, June 6, 1913, with the following history:

Three years previously he had been examined by Dr. Page, at which time a well-compensated mitral stenosis was recognized, and was traceable to a severe attack of tonsillitis two years before. About ten days before admission to the hospital a severe attack of acute follicular tonsillitis had developed. Because of the many duties attending the commencement season, the patient did not remain quiet, but looked after his work to a large extent. On the eighth day of his illness he was suddenly seized with intense pain in the left foot, especially the large toe; the toes became swollen, of a reddish dusky color, and the pain became so severe as to require large doses of morphia. Upon admission to the hospital, the plantar region of the foot was of a dark-blue color; the discoloration gradually extended to other portions of the foot; tactile sensation was absent to about the ankle. The intense pain peculiar to ischaemic gangrene was almost continuous, so that the patient was kept under the influence of an opiate all the time. A harsh diastolic murmur was heard in the aortic valve region, and a presystolic murmur over the mitral area clearly indicated an old mitral lesion. The temperature ranged from 100° to 103°, and was of distinctly septic character.

Amputation of the left foot was deferred to await the development of a clearer line of demarcation, and during this time the patient became more and more exhausted.

About twenty-four hours before death, paralysis of the left arm, weakness of the left leg, and paralysis of the lower portion of the left side of the face were manifest; there was some difficulty in speaking and swallowing. Consciousness remained until twelve hours before death on June 20, 1913.

Evidently this was another instance of multiple embolism, due to an acute tonsillar infection.

Autopsy by Dr. Harnagel, eight hours postmortem.

Report.—Body of a man of medium height and weight. Left foot discolored, being of bluish-black color, which extends to just above the ankle. The covering skin is dry, but the tissues generally are soft. An occluding thrombosis is found in the upper part of the posterior tibial artery, extending to the lower portion of the popliteal artery. There are no other areas of discoloration, and no signs of an eruption.

Thoracic Cavity.—No increase of pleural fluid. The lungs are light pinkish-gray and soft; crepitation throughout. The pericardium is normal, with no excess of pericardial fluid.

Heart.—Of rounded form and about normal size. Left auricle greatly dilated, and walls thickened. Left ventricular walls relatively thin as compared with the other chambers. Right auricle normal. Right ventricle walls relatively thick, being almost two-thirds as thick as the left ventricular wall. Mitral valves reveal the seat of an old fibroid lesion. The leaflets are broadly adherent to each other, leaving only a button-hole, slit-like opening near one side admitting the tip of the little finger. The tricuspid and pulmonary semilunar valves are normal. The aortic valve segments are thickened, with a limited number of fresh granulations

on the closure surface; a firm, rod-like antemortem clot, three-eighths of an inch in diameter, extends from the aortic valve into the aorta for six inches.

Abdomen.—Peritoneal surfaces smooth, no fibrinous or serous exudate. The liver is moderately enlarged, with some fatty infiltration. Spleen shows some passive congestion. Kidneys normal in size. Cortical portion reveals a moderate parenchymatous degeneration. Stomach and intestines are normal.

Brain.—General appearance normal; nothing unusual about the cortex or base. In the depths of the right Sylvian fissure, in the right middle cerebral artery, a small occluding thrombus is observed. Upon section of the brain distinct acute softening of an area about two inches in diameter is noted in the right internal capsule region. Other portions of the brain substance appear normal.

Anatomical Diagnosis.—Ischæmic gangrene of left foot and leg due to occluding thrombus in left popliteal artery; fibrous mitral stenosis; occluding thrombus of right middle cerebral artery, with anæmic softening of right internal capsule region.

The acute tonsillar infection was evidently the main factor in the thrombosis of the left posterior tibial artery; but the antemortem thrombus formation in the beginning portion of the aorta must be considered in the explanation of the embolism of the right middle cerebral, incident to the terminal period of the illness.

CASE V.—Male, fifty-seven years of age. Acute follicular tonsillitis; cervical lymphadenitis; femoral thrombophlebitis; local abscess formation; general fatal septicæmia.

This patient was one of a series of ten cases occurring in the practice of Dr. W. S. Greenleaf, of Massena, Iowa, all being members of one family, although living at some distance from each other, but easily connected by reason of visiting. They were all cases of tonsillar infection accompanied, in most instances, by a small amount of false membrane with abscess formation in the tonsil and associated lymphadenitis in the axillary and cervical glands. There was also an erythematous eruption followed by moderate desquamation in practically all of the cases. All were clearly instances of contact infection.

The predominating organism in the exudate of the mucous membrane of the throat was a streptococcus. Klebs-Löffler bacilli were not present.

These were similar to instances of tonsillar infection with associated lymphadenitis and septicæmia, such as have been reported in Chicago, Boston, and other sections of the country during the past two years.

The patient in question was the father of the family, a man fifty-seven years of age, a retired farmer previously in good health, who became infected from a daughter, who had gone out to visit one of the boys on the farm where the disease prevailed. The primary inflammation of the patient's throat seemed to subside after a few days, and then seemed to become again noticeable with a small amount of membrane appearing on each tonsil. This disappeared after two or three days' treatment. During all this time his temperature had not been above

101°. About the sixth day of his illness he began to complain of a pain in the calf of the left leg and along the inner portion of the thigh. He had refused to remain quiet because he did not think his illness severe enough to warrant it. When seen by the physician, he presented a distinct painful swelling along the course of the left femoral vein, with some oedema over the anterior tibial and the malleolar region. The swelling in the femoral region rapidly increased, soon leading to an area of fluctuation which, when incised, gave vent to a considerable quantity of pus in the intermuscular and subcutaneous tissues. A general septicaemia soon manifested itself, and the patient died on the tenth day following the first appearance of the symptoms. This seemed clearly an instance of septic thrombophlebitis of the left femoral vein with subsequent infection and abscess formation in the surrounding tissues, superinduced by walking around during the course of systemic infection.

All of the remaining nine cases recovered, although some of them passed through a rather long course of illness.

CASE VI.—Acute tonsillitis; bacteraemia; acute parenchymatous nephritis; oedema; uræmia; thrombosis of the right internal jugular vein and right cavernous sinus.

This patient, Mr. I., twenty-one years of age, a young immigrant from one of the eastern Austrian provinces, required an interpreter, which made it difficult to learn much from him direct. His previous medical and family histories presented nothing unusual.

Soon after landing in New York, in February, 1912, he developed a severe tonsillitis associated with cervical lymphadenitis, which subsided after a two weeks' illness, but still left him with moderate fever, some swelling of the face, headache, and digestive disturbances. On April 6, 1912, about six weeks after the beginning of his illness, he was admitted to the Iowa Methodist Hospital, at which time he presented the following:

Status Præsens.—Young man of short stature, mental state dull; skin pale, and diffuse subcutaneous oedema gives to it a waxy appearance. Eyelids very much swollen by the oedema, the eyes being nearly closed. External genitals and scrotum are markedly oedematous. The pupils are equal, and react to light and accommodation. Tongue is heavily coated; tonsils are enlarged, irregular in size, a whitish exudate filling the crypts. No enlarged or palpable lymph-nodes are present. The chest is round and well proportioned; breathing is dyspnoëic. On percussion the lungs are clear; upon auscultation a few moist râles are heard in the posterior lower portions. The heart is dilated, a soft systolic murmur being heard most prominently over the mitral region. The systolic pressure is 120 mm., diastolic 90 mm. The abdomen is greatly distended, ascites being present; the liver is tender and palpable; the spleen is not palpable. The lower extremities are markedly oedematous, the oedema extending the entire length of the limbs. Deep and superficial reflexes are normal; no Babinski reflex nor ankle-clonus.

Blood.—Hæmoglobin 60 per cent. (Sahli), red cells 3,920,000, leucocytes 14,000. Differential count: polymorphonuclears 84 per cent., lymphocytes 12 per cent., large mononuclears 4 per cent. Widal agglutination test negative. A blood culture revealed a diplococcus, resembling the pneumococcus.

Urine.—Diminished in amount, the 24-hour quantity ranging from 500 to

800 Cc. Reaction acid, specific gravity 1024, albumin present in large amount; no sugar nor indican present. Sediment consists of a large number of granular casts, leucocytes, and red blood-cells.

At the time of admission the diagnosis was acute tonsillitis and acute parenchymatous nephritis with accompanying diffuse œdema.

The patient was not responsive to the ordinary measures of treatment, and his condition gradually became worse. The subcutaneous œdema persisted, even becoming more marked; the urinary findings did not improve, the amount gradually becoming less, and during the last five days of the patient's life the urine was practically suppressed.

A petechial, purpuric-like eruption developed soon after admission and covered the body, which emphasized the septic-like character of the infection. Uræmic convulsions appeared during the last two weeks, and were a prominent factor in hastening death. During the last week a diffuse indurative and painful swelling appeared on the right side of the neck and extended from behind the right ear downward; accompanying this the upper right eyelid became greatly swollen, closed the eye, and made the right eye appear more prominent than the left. This condition suggested a thrombophlebitis of the right internal jugular vein and cavernous sinus. Death occurred on April 22, 1912. Autopsy examination, ten hours postmortem, by Dr. D. J. Glomset.

Record.—The body is that of a white man, of medium height and fair development. Body heat is present, as are also postmortem rigidity and lividity in the dependent portions. The upper right eyelid is markedly swollen, completely closing the eye, and there are hemorrhagic spots over the inner canthus. This swelling becomes diffuse and extends downward to the neck; it is soft and yields readily to pressure. A frothy, bloody fluid flows from the mouth. The pupils are moderately contracted and unequal, the left measuring about four millimetres and the right about six. The inguinal glands are enlarged. There is marked œdema of both the lower extremities. The subcutaneous fat is well preserved.

Peritoneal Cavity.—The cavity contains about 500 Cc. of a semi-purulent fluid, containing flakes of fibrin. Punctate hemorrhages are present over the lateral portions of the peritoneum on the right side, and extend over to and on the mesentery. There are petechial hemorrhages over the parietal part of the peritoneum on the left side. The omentum partially covers the intestines. Attached to this structure are soft, yellowish masses of semi-solid consistency. Similar masses are also attached to the gall-bladder, the cæcum, and the appendix.

Pleural Cavities.—The pleural cavities contain a few cubic centimetres of straw-colored fluid. A few adhesions are present on the right side between the parietal and visceral pleurae and over the upper lobe. These can be readily torn apart.

Pericardial Cavity.—No adhesions. The leaves of the pericardium are smooth.

Heart.—The myocardium is soft and flabby. The heart is normal in size. The right ventricle is somewhat distended, the left contracted. The mitral orifice admits three finger-tips, and the tricuspid four finger-tips readily. The valves are unchanged.

Lungs.—The right lung is adherent everywhere posteriorly to the chest-wall; the adhesions can be removed with ease. The lung is bound by firm adhesions to the diaphragm. The organ crepitates throughout. The peribronchial lymph-glands are enlarged and firm. The left lung, in the posterior portion of the lower

lobe, has a boggy feeling and on cut section drips blood, the rest of the lung being unchanged.

Liver.—The liver is slightly enlarged. Its surface is smooth and mottled yellow in color. It cuts readily, and from the cut surfaces a small amount of black, sticky blood exudes. The cut surface shows the lobular markings fairly distinct.

Spleen.—The organ is about normal in size. A large amount of a black, bloody fluid issues from the cut surface.

Kidneys.—The left kidney weighs 400 grammes. Its consistency is soft. Its surface is distinctly grayish-white. The surface veins are distended. The relation between the cortex and medulla is as one to two. It cuts without resistance. The cut surface is diffusely grayish-white in color. The lobular markings can not be made out. The capsule strips readily, and is normal in thickness. The right kidney is similar to its fellow.

Stomach.—Normal in size and shape, its mucosa unchanged.

Bladder.—Contracted and absolutely empty.

Brain.—The superior longitudinal sinus is distended and bulges irregularly, especially toward the right side. It contains a soft clot, grayish-red in color. The upper surface of the brain is seen to be covered with a gelatinous fluid which fills up the sulci and the fissures. This edematous fluid also extends toward the base. The brain substance is very soft and moist, otherwise unchanged.

The upper or sinus portion of the right internal jugular vein is filled with a soft grayish clot. The right lateral and cavernous sinuses are distended, the intimal lining revealing small deposits of fibrin in different portions.

There is no sign of otitis media, nor any change in the mastoid cells of either side.

The microscopic examination of the kidneys revealed parenchymatous degeneration of the tubular epithelium and round-cell infiltration of the glomeruli and intertubular areas, small clusters of diplococci being present in each histologic section.

Anatomic Diagnosis.—Acute parenchymatous nephritis, general bacteræmia, acute fibrinous peritonitis, thrombophlebitis of right internal jugular vein; right cavernitis and thrombosis of cavernous sinus.

Bacteriologic Diagnosis.—Diplococcus infection, nephritis, and general bacteræmia, probably due to primary severe tonsillar infection.

CASE VII.—Acute pleurisy; central pneumonia; thrombophlebitis of right and left jugular veins; acute right and left cavernitis; exitus. Duration of illness four days.

The patient, a girl seventeen years of age, was a stenographer, of previously good health and excellent family history. While at her work on March 5, 1911, she complained of a sharp pain in the lower part of the left chest. When examined by a physician a localized pleural friction murmur was detected; aside from moderate fever there was no systemic distress. The patient remained at home, and on the second day developed a severe headache with vomiting, and the left eye became prominent and seemed to bulge forward. This prominence of the left eye increased, and consciousness was gradually lost; on the day following, the right eye began to bulge forward, but to a less degree. Death supervened on the next day, or the fourth day of the patient's illness.

Because of the symptom of bulging of the eyes, a diagnosis of thrombosis of cavernous sinus was made by Dr. Wertz and Dr. Pearson. There were no clinical signs to indicate an otitis media. The physical signs in the left chest were so slight that they were not considered of special significance.

Autopsy by Dr. A. Rocke Robertson, fourteen hours postmortem, March 10, 1911.

The body is that of a young girl of good physique and excellent nutrition; rigor mortis is complete, body injected. The left eye and lid are prominent, and the left conjunctiva is markedly swollen. The eye as a whole is pressed outward somewhat. The right eye appears about normal. In the left temporal region, close to the hair line, is an area covered with slough which reaches almost to the periosteum. No palpable glands. The subcutaneous fat is quite abundant.

Peritoneal cavity shows the normal moist, glistening condition of its serous membrane. The large intestine is considerably inflated, the small intestinal loops only moderately so. The mesenteric lymph-glands are not enlarged. The appendix is long, measuring about 12 cm., and lies retroceecally. There are no pelvic or peritoneal adhesions. The internal genitalia appear perfectly normal. The left ovary shows a corpus hemorrhagicum. The right contains a small cyst, about 2 cm. in diameter. The uterine mucous membrane is pale and normal.

Pleural cavities are both free of adhesions. On the left side over the entire diaphragmatic surface and extensively over the posterior lateral aspect of the lower lobe there is a layer of quite recently deposited fibrin of a yellowish-gray color. This strips with comparative ease. No free fluid is present.

Pericardial cavities contain a slight amount of free fluid. Scattered over the surface of the heart are numerous small subepicardial petechial hemorrhages. The heart is of normal size and consistency. Its chambers are moderately filled with blood, showing typical post-mortem white and dark clotting. The endocardium is smooth throughout. The myocardium is somewhat soft, and shows yellowish streaks throughout its substance. The valves are all thin and normal in appearance.

Lungs.—These organs are large and bulky, and completely fill their containing cavities. They are somewhat firmer than normal, on

account of the formalin injection. Scattered throughout both lungs and in all lobes are larger and small, dark-reddish areas of consolidation. The reddishness is for the most part due to hemorrhage. The largest areas measure about 3 cm. in diameter, but numerous small areas are seen of about .5 cm. to 1 cm. in size. Such consolidation areas project considerably above the surface, especially upon the posterior. The bronchial mucous membrane is smooth and pinkish in color. The lumen contains a little mucus.

Liver.—Weighs about 1500 grammes. Consistency firm, on account of the formalin injection. On section it is a rather pale-brownish in color and appears perfectly normal. Gall-bladder is about half full of dark tarry bile. The passages are clear.

The spleen is markedly enlarged, and weighs about 400 grammes. Surface is smooth, of purplish-blue color, the anterior margin rounded, and the notches accentuated. On section the Malpighian bodies are very distinctly visible and considerably enlarged. The pulp is of deep reddish color and soft consistency. It yields readily when scraped with a knife.

Pancreas appears normal in all respects. The consistency is not increased, and lobulations are well marked.

Kidneys are slightly swollen, weight about 30 grammes. On section the cortex bulges slightly from the capsule. The color of both cortex and medulla is uniform, being a dark fiery red. The glomeruli can be identified as quite prominent, dark-reddish bodies. Streaks of red radiating from the medulla are also plentiful. The pelvic mucous membrane is smooth and pale.

The adrenals are absolutely normal in appearance.

Gastro-intestinal Tract.—The mucous membrane of the stomach shows several small petechial hemorrhages; otherwise it is slightly infected only in places. The intestinal tract throughout has a pale normal mucous membrane.

Head.—The scalp is of normal thickness and readily detached from the calvarium. The latter is of average thickness, and is removed from the dura with comparative ease. The external surface of the dura is of pale glistening character. The superior longitudinal sinus is somewhat distended with semi-fluid blood. The dura lifts readily from the piaarachnoid. Over the superior surface of the hemispheres the latter shows some infection of its vessels, but over the left frontal,

parietal, and temporal lobes the piaarachnoid is fiery red and contains focal and confluent areas showing hemorrhage within it. The piaarachnoid covering the temporal (left) lobe, and the interior frontal convolutions of the left frontal lobe, are entirely filled with hemorrhagic exudate. On the internal surface of the left hemisphere the same hemorrhagic condition is found projecting upon that part of the occipital lobe which is adjacent to the cerebellum. The hemorrhage here is most marked near the left crus cerebri. The superior surface of the left cerebellum, close to the crus cerebri, likewise shows considerable hemorrhage into its piaarachnoid. Along the course of some of the vessels, especially the cortical vessels passing upward into the Sylvian fissure, there are accumulations of frank yellowish pus. The consistency of the brain tissue seems to be about normal. The dura mater covering the base of the skull shows the most intense internal hemorrhagic leptomeningitis, limited almost entirely to the left middle fossa, and extending up to the left lateral aspect of the body of the sphenoid. The middle ears were first examined. The left tympanum contains a little grayish, turbid exudate. The membrana tympani is dusky red in color, more particularly about its margin. Minute dilated capillaries can be seen toward the periphery of the mucous membrane. The attic and mastoid cells appear normal, and the right middle ear perfectly normal. The left internal auditory canal contains turbid fluid, and the nerve within it is soft and very readily torn away. The left common carotid is not thrombosed. The left lateral sinus appears normal. Upon opening into the jugular it contains a considerable amount of softened, grayish-red blood-clot, in which firmer clumps are easily picked out; these clumps are inelastic and friable. The left cavernous sinus is distinctly enlarged; on opening it, it is found to contain much firmly clotted blood. The left gasserian ganglion is swollen, and its surface turbid. Many blood-clots adhere to it. Upon removing the superior bony wall of the left orbit the intra-orbital tissue bulges very markedly into the newly-made opening, showing that these tissues are under considerable hypertension. Deep incision into these tissues reveals no abscess, but the tissues are excessively œdematosus, and contain much hemorrhage in their substance. The pituitary body is somewhat swollen; its surface dusky red in color. The dura mater, covering the posterior wall of the sella turcica, is pressed somewhat forward by the accumulation of hemorrhagic fluid and

blood-clots lying between it and the base. Thus the same condition that exists in the left cavernous sinus extends through the sella turcica into the right cavernous sinus. Here relatively little evidence of acute inflammation is to be discerned. The right gasserian is normal in appearance. The right internal auditory contains a little yellowish-gray fluid, no doubt of purulent character. Upon removal of a portion of the superior wall of the right orbit the tissue bulges slightly as if under slight hypertension. Section of the tissue shows to the naked eye no evidence of acute inflammation. The right middle ear is healthy, likewise the attic and mastoid cells on that side. The right jugular contains a brown, friable blood-clot (thrombus). Both frontal sinuses are normal. The body of the sphenoid is markedly discolored on its left side, and upon lifting the entire superior wall the sphenoidal sinus is seen to be divided into two unequal chambers by the antero-posterior septum. The right chamber is smaller than normal, the left is much larger, and its posterior extremity is divided into two parts, each of which communicates with the anterior part of the chamber. In both of these posterior parts a large accumulation of blood-clot is found lying between the periosteum and the posterior bony wall. It appears then that there has been a direct extension of the process from the left cavernous sinus through the bone into the left chamber of the sphenoidal sinus. The ethmoidal cells throughout appear perfectly normal. All of them were broken into systematically, but no pus foci were found. Several adenoids in the vault of the nasal spaces are present, but of no great size. The left tonsil is somewhat enlarged. The right appears normal. In an endeavor to explain the presence of pus in the right internal auditory canal, the tissues from the right cavernous sinus toward the internal meatus on the right side were carefully examined. It is clearly seen that infection has extended along the right inferior petrosal sinus, the latter containing semi-fluid blood with small clumps of antemortem clot. Bacteriological examination from the superior surface of the left frontal lobe, from the inner surface of the dura covering the left middle fossa of the skull, and from the spleen show the presence of a Gram-positive coccus, arranging itself typically as staphylococci, and on all the ordinary culture media it produces yellowish pigment. Bacteriological diagnosis—staphylococcus aureus infection.

Anatomical Diagnosis.—Septicaemia with multiple petechial

hemorrhages. Pneumonia, in places hemorrhagic. Acute fibrinous pleuritis. Thrombosis of right and left jugulars, the left having undergone softening; otitis media (left). Acute inflammation of both cavernous sinuses, the sphenoidal sinus, the left orbit, the right inferior petrosal sinus, and the right internal auditory canal. Acute hemorrhagic leptomeningitis.

The postmortem findings seem to indicate that the condition commenced as either a septicæmia in which a pneumonia at the left base developed and was followed by an acute pleurisy, or that the condition commenced primarily as a pneumonia followed by a pleurisy and then a septicæmia, the lesions in the head being due to infection brought to it by the blood stream.

In the last two instances it is of interest to note that the terminal cerebral sinus thrombosis was a part of the general septicæmic process, and not associated with an inflammatory condition in the neighbouring tissues, as is usually the case.

In this series of circulatory accidents the acute infectious process in four instances was an acute tonsillitis, and there was one example each of acute pleurisy and pneumonia, of influenza, and of appendicitis.

As regards localization, the posterior tibial artery was involved twice, the middle cerebral three times, the axillary artery once, there was one example of femoral thrombophlebitis, and there were two of cerebral sinus thrombosis. In two cases multiple embolism occurred in the same patient.

There is still considerable lack of unity in the explanations offered for thrombus formation. In a recent discussion by Ribbert,¹ primary importance was given to changes in the intimal lining of the vessel wall; without such changes thrombus formation does not take place. He recognized the influence of a slowing of the blood current as a necessary factor, but regards it as of rather secondary importance. Aschoff,² on the other hand, is inclined to give to a slowing of the blood current, consequently to physical changes in the blood stream, a primary importance.

Changes in the coagulability of the blood are regarded by others as an important factor. The effect of toxæmia and septicæmia in thrombus formation evidently bears a very close relation to its effect

on the coagulation time of the blood. The shorter the coagulation time, the more likely thrombosis, and *vice versa*.

These blood changes have been thoroughly reviewed by Myer Solis-Cohen,³ and his conclusions demonstrate that no one particular chemical condition of the blood can invariably be held responsible for thrombus formation, nor can we change at will the chemistry of the blood so as to prevent or favor thrombosis, as even those substances on which we have most relied to alter the blood's coagulation time, —calcium salts, gelatine, citric acid, etc.,—act differently in the presence of different diseases.

In experimental work, such as that of Jakowski,⁴ after bacterial infections into rabbits and guinea-pigs, thrombus formation was always dependent on accompanying vessel constriction, and without the latter it did not take place.

Anatomic conditions are offered in explanation of a retarded blood flow, particularly as a reason for the greater frequency of femoral thrombophlebitis of the left leg as compared with that of the right side. As determined by Liebermeister, the crossing of the left common iliac vein by the left common iliac artery compresses it against the body of the fifth lumbar vertebra and intervertebral disc; and, as further observed by Haward,⁵ the left internal iliac artery, as it passes downward to the great sacrosciatic foramen, crosses the left external iliac vein at a right angle, which is in marked contrast to the relation of the vessels on the right side.

Cerebral sinus thrombosis is usually the result of transmitted infection from the antrum or the mastoid cells, and only rarely occurs as a part of systemic infection, as is illustrated by the two cases in this series.

In endeavoring to offer an explanation, it should be borne in mind that to the cerebral membranes or meninges belong the sinuses with the contributory branches,—the veins; thus any inflammation of the meninges must also affect the different sinuses.

Earlier writers, like Huguenin in *Ziemssen's Handbuch*, and later Quincke, Finklestein, and Pfaundler, called attention to a simple sero-fibrinous meningitis or non-suppurative leptomeningitis in connection with severe toxæmias and septicæmias. That which is called cerebral œdema is probably, in most instances, an example of this kind.

In the two cases in this series, such a simple leptomeningitis was

present; and, in connection with the cavernitis, small fibrin collections were noted in different areas attached to the intimal lining of the sinus.

It is interesting to note that the symptomatology of cavernous sinus thrombosis presents in the prominence of the eyeball, with the accompanying oedema of the eyelids, which is usually unilateral, a symptom-complex that is almost pathognomonic, and permits a diagnosis to be made with considerable certainty.

In a recent contribution by F. Kraemer⁶ attention is again directed toward the value of premonitory signs in thrombosis and embolism. These observations are based on Mahler's⁷ symptom, consisting of a gradual step-like acceleration of the pulse-rate in connection with a normal temperature curve.

Heidemann,⁸ in 1901, reported six cases in which careful observance of Mahler's symptom had led to the recognition of latent thromboses. Kraemer similarly reports several cases in which the symptom was successfully applied.

In summarizing our series of cases, which were all instances of acute infection accompanied by general bacteræmia or septicæmia, tonsillitis, and particularly acute infection of the upper air passages, played a prominent rôle. This gives to acute tonsillar infection an importance that may not heretofore have been recognized, supports the conception that it is an expression of general septicæmia, and, most of all, emphasizes the need of rest as the main essential in its treatment.

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Surgery

THE SURGICAL TREATMENT OF INFANTILE PARALYSIS

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THE treatment of infantile paralysis is demanding more and more insistently an important place in surgery. One-third of the total number of patients treated in the orthopædic dispensaries of our large hospitals suffer from this disease, which is infective and epidemic, and attacks chiefly young children. Of 268 cases reported by Tubby, 256 occurred in children under five years of age and only five in children over ten years old. It partially or totally destroys the motor nerve-cells, and, secondarily, markedly disturbs the circulation of blood in the affected part. We are, therefore, dealing with a disease which attacks the child during the period of most rapid growth, when the bony skeleton is in its most plastic condition, and which more or less permanently impairs the musculature, and the nutrition of both the bones and muscles of the affected part.

Symptomatically, infantile paralysis may be divided into three stages: First is the stage of the acute attack in which there are symptoms of a general toxæmia followed by the sudden onset of paralysis; second, the stage of partial recovery in which the nerve-cells not completely destroyed begin again to functionate and in which deformities first appear; third, the permanent stage in which there is no further improvement in the paralyzed muscles, and in which the deformities become more varied and more marked.

The treatment of infantile paralysis varies in these different stages. In the first, medicinal agents stand out preëminent. In the second, non-operative orthopædic treatment is begun. We have here to stimulate the recuperating nerve-cells, to tone up the vascular

system, to maintain the nutrition of the paralyzed muscles so that they may fully utilize returning nervous impulses, and to prevent deformities which might arise from the pull of the unimpaired muscles. Warmth, mild electrical stimulation, and gentle massage, together with the use of splints and braces to hold the limbs and trunk in normal position, are of the greatest value.

Above all, the child should try to move the paralyzed limb. Such attempts not only stimulate the muscles and blood-vessels to functionate normally, but also stimulate the nerve tracts. In this stage, too great stress cannot be laid upon the importance of early treatment, for, if instituted, many of the later operative procedures could be dispensed with and the length of treatment much shortened. Unfortunately, the surgeon meets the cases long after all spontaneous recovery of power has ceased. The paralyzed muscles have been atrophied. The unopposed active muscles have caused numerous deformities, which have been increased by the force of gravity and the faulty positions assumed by the patient. Before the surgeon is laid the seemingly impossible task of bringing out some semblance of normality and usefulness. The ultimate aim of the treatment in this stage is to bring the child back to a life of usefulness without the aid of external supports. This can be done in cases in which only a few groups of muscles are paralyzed and in which there are enough strong muscles to perform the work of the crippled ones. In the next class we have the cases in which there is almost total paralysis of the lower extremities. Here the best that can be hoped for is to give the patients additional external supports that will make locomotion possible. In the more severe cases in which there is paralysis of both upper and lower extremities our aim is to prevent deformity and to give the patient the maximum benefit of his remaining muscle power. The measures resorted to by the orthopædic surgeon to obtain these results may be grouped as follows:

Massage and muscle training.

Mechanical supports.

Operative procedures, including: tenotomies, fasciotomies, tendon lengthening, shortening of relaxed tendons and ligaments; tendon and nerve transplantation, insertion of artificial ligaments, arthrodesis, osteotomy.

In the choosing and combining of these measures lies the secret

of the successful treatment of infantile paralysis. Each case is a law unto itself, differing from others in the degree and position of the paralysis, and requiring of the physician the combination of mechanical ability, surgical skill, and sound common sense.

Electricity, massage, and muscle training are, as has been stated, of great value, especially in the early stages. But massage and muscle training also play an important part in the successful treatment of the more chronic stages. A portion of the treatment can be carried on by the patient's parents, especially the maintenance of the general nutrition and circulation by massage, but the stimulation of special groups of muscles can be better carried out in a specially-equipped gymnasium directed by an expert trained in these particular lines.

Great improvement can be brought about by such methods even after paralysis. Voluntary attempts to move the paralyzed part are of the greatest assistance, but the difficulty in obtaining such movements in young children is great. It is essential that the element of play enter into their exercises. A child will make no effort to move a weakened limb unless stimulated by the desire to play or to compete with other children. In a gymnasium such as has been mentioned the stimulus of both play and competition can be obtained far better than at home. Massage and muscle training, too, play an important rôle in the after-treatment of the operative correction of deformities. In a large per cent. of cases the successful result of such combined treatment depends more on post-operative gymnastics than on the actual operation.

Mechanical appliances are valuable in the prevention of deformity, both in the early stages and after surgical intervention. They are more widely used as a support to the weakened limb, and can supply the function of certain groups of paralyzed muscles by the use of elastic straps and spring supports. No set type of brace can be outlined. Careful planning of the support for each individual case cannot be too strongly emphasized. The weakened and distorted joints must be strengthened and corrected, the action of the paralyzed muscles must be augmented, and the pull of the strong muscles restrained. At best the brace is but a clumsy substitute, and exact adjustment of its every detail is necessary to insure the best results.

The rapid correction of deformities by surgical means has greatly increased the efficiency of brace treatment. The lengthening of con-

FIG. 1.



A hop-leg and contractures at hip and knee.

FIG. 2.



Scoliosis following paralysis.

FIG. 3.



Total paralysis of leg with back-knee.

FIG. 4.



A.
Paralysis of both legs. Condition before (A), during (B), and after (C) treatment by massage and exercises.



B.



C.

FIG. 5.



Total paralysis right leg with knock-knee and talipes valgus

tracted tendons by the pull of the elastic straps of the brace is a tedious and only partially successful procedure. On the other hand, such a deformity can be completely corrected in a few minutes by the cutting of the contracted tissues.

Tenotomy has attained a well-established place among surgical procedures for the cure of infantile paralysis, but it can be overdone. The contracted fascia or tendon of a healthy muscle may be cut and the deformity reduced, but it must be remembered that such a reduction is not permanent, and that preventive support must be added. In the contracted tendons of paralyzed muscles it has been found that tendon-lengthening is the procedure of choice. In this a Z-shaped incision of the required length is made in the tendon, and the severed ends are reunited to give the proper length. An additional result of tendon-lengthening is to stop the overstretching of the opposing muscles and to reestablish, primarily, their proper nutrition, and, secondarily, their strength.

The shortening of overstretched tendons, except as a part of more extensive operations, has not yielded good results. A paralyzed muscle will gradually stretch again as soon as any strain is thrown upon it. The shortening of the more solid fasciæ and joint ligaments has proved more successful. The forcible correction of a deformity under an anæsthetic is more rapid and accurate than by mechanical measures. Such correction may be sufficient, or it may be used as an aid to tenotomy and tendon-shortening.

These operative measures can be classed as adjuncts to brace supports and, as a rule, can be used only in this way. They may be performed even in young children, and are undoubtedly of great assistance in correcting severe deformities and in restoring the limb to its natural position; but they give only symptomatic relief, and do not relieve the underlying condition.

Again, in all these operations the immediate postoperative treatment should be complete fixation by plaster-of-Paris casts for from four to six weeks, or until cut tendons have entirely reunited.

Another operative method which may be used either with or without subsequent brace support is the insertion of artificial ligaments to strengthen the weakened joints. In this method sterilized strands of heavy silk are inserted into the periosteum or, preferably, into the bone itself, both proximally and distally to a joint, to prevent excessive motion. This has been successfully performed by

numerous surgeons, and has given permanent results. The introduction of artificial ligaments is also an aid in tendon-transplantation and in arthrodesis.

Tendon-fixation, especially of the foot, has been suggested. The operation aims to prevent deformity of the foot by rigidly fastening the paralyzed tendons to the lower portions of the tibia and fibula so that they hold the foot in its normal position in much the same manner as do artificial ligaments. The method consists in making a subperiosteal groove in the bone, laying the paralyzed tendon in the groove, and firmly suturing the periosteum over it. The tendon in this way becomes a rigid, fibrous band acting practically as a stop-joint, and preventing the recurrence of deformity from the pull of opposing strong muscles. But this operation should be performed only on totally paralyzed muscles, as it prevents any future motion of the fixed tendon. Gallie reports successful results in cases of paralytic varus, calcaneus, equinus, and valgus. Both Gallie and Codivilla have shown that postoperative immobilization for three months in plaster-of-Paris is necessary. Putti has suggested that the leg bone be tunnelled, that the tendons to be fixed run through this and that the free ends be sutured beneath the periosteum. In this way postoperative immobilization need be maintained for only two or three weeks. He reports four cases with successful results by this method.

Perhaps the most common and satisfactory operative procedure in infantile paralysis is tendon-transplantation. By this is meant the reinforcement of the action of some paralyzed muscle by the attachment to it of the tendon of a healthy muscle. This is usually accomplished by transferring a strong tendon on the opposite side, which is increasing the deformity, to the side in need of assistance. For example, a strong flexor may be made into an extensor, a strong everter into an inverter. In planning a tenoplasty we can follow no set rules, for we have in each case a distinct mechanical problem which must be solved. We have a given deformity and a few strong muscles, and we must decide at what point the pull of those strong muscles will do the greatest amount of good. It is obviously useless to transplant weak, semi-paralyzed tendons or to expect a normally small muscle to replace or to counteract the pull of a strong one.

Codivilla, Whitman, Fitch, Lange, and others have carefully

FIG. 6.



Partial paralysis of foot, with contracture of extensor longus hallucis and tendo Achillis.

FIG. 7.



Brace for total paralysis of legs.

FIG. 8.



Brace for partial paralysis of legs.

FIG. 9.



Result of transverse horizontal section of right tarsus for calcaneo-eavus.

tabulated the relative strength of muscular action in the lower extremities and the part each muscle plays in the motions of the foot, and have calculated what transplantations will give the best results in the usual types of deformities. In planning such an operation, movements of the fingers rather than of the wrist, stability of the foot rather than mobility, and movements of the tarsus rather than of the toes must be considered.

Again, tenoplasty is an operation that should be done only after a prolonged course (two years or more) of electricity, massage, and muscle-training has developed the weak muscles to the full limit of their ability.

The aim in tenoplasty is to transfer the power of overacting muscles to weakened muscles, to replace the action of paralyzed muscles, and to supplement arthrodesis.

Tendons may be transplanted into the tendons of the paralyzed muscles or into the bone and periosteum at some suitable point. The first method obviates the use of artificial tendons, but it has the disadvantage that the weakened tendon may be overstretched by the pull of the strong transplanted tendon and thus nullify the desired results. The second method permits a much stronger insertion, and at the most suitable point.

In the performance of this, as of the other operations, perfect asepsis is an absolute essential. It is always advisable to leave the wound untouched for from four to six weeks after operation. The fact that the wound is made in a limb the vitality of which is distinctly lowered by poor circulation is an additional incentive to avoid infection. At the University Hospital the site of operation is thoroughly scrubbed the night before the operation, and the part covered by a sterile dressing. On the table the operative area is painted with five per cent. tincture of iodine, and the usual aseptic operative technic is most strictly adhered to. As a preliminary to operations on the foot, it is very essential that all calloused skin should be softened and pared away, not only to remove bacteria, but to prevent pain from pressure of the subsequent plaster casts.

It is important that the incisions be so located that the subsequent scar will not be pressed upon by shoe or brace. Three incisions are usually necessary. The first is made to divide the insertion of the tendon to be transplanted; the second is made at the point of deviation

of this tendon, and the third at the new place of attachment. Through the second opening the tendon is pulled out, seized by long-toothed forceps, forced through the soft subcutaneous tissues to its point of insertion, and here anchored to the periosteum and bone by chromized gut or silk.

Chromic catgut has been our preference as a suture material both for deep and skin sutures. Silk is at times necessary in the formation of artificial tendons, but silk is non-absorbable, and always remains as a foreign body in tissue of low resistance. It must be admitted, however, that Lange, Tubby, Lovett, Bradford, and others have had marked success in its use.

Following operation the limb is placed in a plaster cast, and kept in absolute fixation for six weeks or more. This is followed by massage, electricity, and passive motion until the newly-transplanted tendon is brought up to its best condition. Recently it has been suggested that in the foot the transplanted tendon may be looped around the metatarsal bone and sutured to itself. It is claimed for this technic that the length of time for postoperative fixation is much shortened, and that massage and motion can be begun earlier. Tendon-transplantation has been criticised by many writers, but even they admit that at least partial restoration of normal function in the part is the usual result of the operation. The best results have been obtained in correcting varus, valgus, and equinus deformities of the feet. Transplantation of the hamstring tendons to the quadriceps at the knee has also been successful.

Arthrodesis, or the fixation of a joint, is the measure finally resorted to in the treatment of infantile paralysis when the joint is flail-like, and when no further improvement in the muscles can be expected. The procedure is rarely advisable in children under ten years of age. The best results are obtained at the ankle and foot-joints and to a less degree at the knee. Fixation of hip- and shoulder-joints has been recommended, but the results have been unsatisfactory. The fixation of such a joint in the most useful position prevents recurrence of deformity, lessens the amount and weight of apparatus required, and gives a fixed point for the movements of the non-paralyzed portions of the limb. The operation is a simple one; it consists in removing the articular cartilages of the adjacent bones and holding the limb in the required position until firm ankylosis

occurs. In deformities of the feet arthrodesis is most efficacious. The joint usually selected is the subastragaloïd, where a true arthrodesis, or a combination of arthrodesis and osteotomy, may be performed. Arthrodesis at the ankle may often result in fibrous instead of bony ankylosis, and to prevent this, transplantation of a strip of bone to bridge the joint has been successful.

Osteotomy, either linear or wedge-shaped, is occasionally of use in the correction of marked deformity. Severe cases of paralytic knock-knee, flexion of the knee, talipes varus and valgus, offer practically the only field for its use.

Transplantation of the nerves supplying the paralyzed muscles has been attempted, and some cases have been reported in which experimentally the results were favorable; but in the treatment of those cases of infantile paralysis in which both the nerve-fibre and the muscle have undergone long-continued degeneration the percentage of good results has been small. To be successful the paralyzed nerve must be anastomosed to a nerve-trunk considerably larger than itself. This fact practically confines the operation to the nerve supply of restricted areas, and in the paralysis of such areas other surgical procedures, such as tendon-transplantation, tendon-lengthening, and arthrodesis, have been followed by such good results that they have established their right to primary consideration.

The technic of nerve anastomosis has been fully worked out, and various methods have been described, of which two are most often performed. First, the peripheral end of a paralyzed nerve may be inserted into a transverse or longitudinal cut made in a healthy nerve; or, second, the healthy nerve may be completely severed and the peripheral ends of both healthy and paralyzed nerves sutured to it. After operation a long course of electricity and massage must be carried out.

The above is a brief review of the surgical measures generally used in the treatment of infantile paralysis. For the more common deformities following this disease, certain combinations of these procedures have been accepted as the most promising treatment.

In paralyses of the trunk muscles, support by means of a brace or plaster-of-Paris cast, together with long-continued massage and exercise, is our only treatment.

In the upper limb the first step toward the removal of deformities

is to prevent over-tension of the paralyzed muscles. This may be effected by mechanical supports, tendon-transplantation, tendon-lengthening, or by fixation to a joint by artificial ligaments. Arthrodesis is rarely of use, although it is advocated for flail-shoulder with luxation. In cases of flail-elbow Mr. Jones has recommended the excision of a lozenge-shaped area of skin and subcutaneous tissues on the anterior side of the joint. The edges of the wound are then sutured together. The scar thus formed in the soft tissues acts as a stop-joint preventing over-extension.

In the lower limb the muscles of the foot and lower leg are most often affected, and these paralyses cause the common foot deformities. Talipes equinus, or toe-drop, due to paralysis of the extensors, may be forcibly corrected by lengthening the tendo Achillis. Recurrence is prevented by the wearing of a brace with elastic strap to lift the toes, and an instep strap to hold the foot firmly in the shoe. Tendon-transplantation is at times advisable. Arthrodesis of the ankle may be performed when the deformity is due to paralysis of all the muscles. In the early stages of the disease this deformity may often be prevented by the wearing of a light brace to prevent the toes from dropping.

Talipes calcaneus, the second of the foot deformities, is practically always associated with cavus. In this condition the os calcis assumes an almost vertical position, the dorsum of the foot approaching the anterior surface of the tibia. In the milder cases shortening of the tendo Achillis and a suitable brace may be sufficient. In the more severe cases more radical operations are necessary. Formerly transplantation of the peroneus longus into the tendo Achillis, as originated by Nicoladoni, was done, but in recent years combinations of tendon-transplantation and arthrodesis have proved more successful, and three special operations are noteworthy.

Dr. Whitman, of New York City, advocates an arthrodesis of the ankle-joint combined with the resection of the astragalus. The foot is then displaced backward on the leg bones until the external malleolus is over the calcaneocuboid joint. In addition, the peronei tendons may be inserted at the attachment of the tendo Achillis. The foot is then fixed by plaster-of-Paris in the equinus position.

Mr. Jones, of Liverpool, describes a two-stage procedure. The first operation consists of the cutting of the plantar fascia, followed

by the resection of a wedge of bone immediately behind the mid-tarsal joint. The anterior portion of the foot is then forced into line with the posterior, obliterating the cavus deformity, and the foot is held in this dorsi-flexed position for four weeks. The second stage consists of an arthrodesis of the ankle-joint with the removal of a wedge-shaped portion of the posterior part of the astragalus. The foot is then held at right angles to the leg bones until union is complete.

Dr. Davis, of Philadelphia, has more recently advised a transverse horizontal section of the bones of the foot below the ankle; this passes entirely through the tarsus, beginning at the juncture of the os calcis and astragalus behind, and emerges on the anterior surface of the cuneiform bones. Such a section passes through the upper portion of the os calcis, the lower portion of the astragalus, and the upper portion of the cuboid scaphoid and cuneiform bones. The foot is then displaced backward, and the peroneal tendons are implanted into the os calcis, after which the foot is fixed in a cast and a brace worn until bony union is complete.

Talipes varus, or paralytic club-foot, is usually of milder type than the congenital form, and is caused by paralysis of the peroneals. In mild cases forcible correction under ether and subsequent cast and brace treatment will suffice. In more marked deformities transplantation of the tibialis anticus into the outer side must supplement other treatment.

Talipes valgus is due to paralysis of the tibials. Here, as in club-foot, forcible correction by means of appliances to hold the foot in a slightly inverted position are sufficient in many cases, and transplantation of one of the peronei or of the extensor longus hallucis to the first metatarsal has proved of the greatest benefit in the more advanced ones.

Any combination of the first two types of foot deformity with the last two may be found, and for these various combinations of treatment must be devised, and the success of the result will depend on the care and judgment used in carrying them out.

At the knee-joint, paralysis of the quadriceps extensor is the most common fault. In mild cases we may use braces with lock-joint at the knee, elastic straps anteriorly, or a set-back knee-joint with heel strap. Transplantation of a strong hamstring tendon has proved beneficial, especially in the cases with contractures of these muscles. When

paralysis of any muscle causes flail knee-joints on both legs, arthrodesis of one knee is indicated if the child is of suitable age.

Paralytic knock-knee is best treated by corrective brace for the milder cases, or by osteotomy in the more severe types.

Paralyses around the hip-joint are more rare. Support by a brace and tenotomy of the contracted muscles give the best results. Paralysis of the internal rotators of the thigh causing marked abduction of the foot has been successfully overcome by suturing the fascia lata to the great trochanter.

The various illustrations (Figs. 1-9) demonstrate visually the different points referred to in the article.

CONCLUSIONS

The surgical treatment of infantile paralysis calls for a combination of gymnastic training, mechanical support, and operative procedures.

The prevention of deformity by the early application of appropriate splints and braces will save many months of treatment in later years.

Any form of locomotion is better than total helplessness. Any child with sufficient arm power to use crutches can be eventually gotten on its feet and trained to some form of locomotion.

No case of infantile paralysis can be cured in one treatment, and rarely in one year of treatment. Patient, persistent efforts on the part of parents and physicians give the only hope for success, and the results now obtained by persistent care are so satisfactory that the large majority of these cases can be brought back, if not to a normal, at least to a useful and happy existence.

INTERESTING SURGICAL CASES

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CASE 1.—*Sinus of Thorax, Tuberculous: Bacterin Therapy.*—J. M., male, white, aged eighteen, the subject of pulmonary tuberculosis, had been operated upon for osteomyelitis of the ribs, and a cold abscess was evacuated and its cavity injected with a five per cent. emulsion of iodoform in glycerine. When he came under the writer's observation, three weeks later, the discharge was profuse and yellowish and thick. Bacteriological examination of the pus was made by a smear, a culture, and by injection of the left inguinal lymph-nodes of two guinea pigs by the Bloch method. All showed streptococci in pure culture. Both guinea pigs died within three days. At autopsy there was extensive cellulitis in both inguinal regions; streptococci, but no tubercle bacilli, were recovered from the pus. An autogenous streptococcal bacterin was prepared of such strength that 1 c.c.m. contained 400,000,000 organisms. On February 11, 1913, drainage being unsatisfactory, the two sinuses present were connected by severing the bridge of tissue between them. Masses of pale and flabby granulations were liberated. Microscopical examination of these by Dr. John Speese showed: "Granulation tissue with capillary loops supported by fine reticulum; various forms of endothelial cells, actively proliferating; occasional giant-cell." A rubber drainage tube was inserted. On February 24th, the first injection, 0.5 c.c.m., of the autogenous bacterin was given. On March 8th the discharge seemed to be lessening, and the fourth injection, 2 c.c.m., was made. On March 11th the discharge was much lessened and the drainage was better, there being no residual pus. He was given five drops, in water, of Donovan's solution three daily after meals as an alterative. On March 22d the seventh injection was given: the discharge was further decreased and the wound was beginning to bleed. He had gained three pounds within the last month. On May 3d, the bacterin being used up, a fresh culture was taken, and streptococci were found, but the predominating organism was *Staphylococcus pyogences albus*. To obtain fluid for this culture the surface of the wound was cleansed, a Bier cup applied, and sero-sanguineous fluid aspirated from the depths of the sinus. A mixed bacterin was prepared and administered. On May 9th he had gained four pounds within the last month, and the discharge was becoming thinner and more scanty. The Bier cup was being used therapeutically at each dressing. On July 11th a third streptococcal bacterin was prepared and administered. On August 4th, there having been several elevations of temperature lately, the patient was sent to the country and instructed in the use of heliotherapy. On September 9th, upon his return, he stated that he felt very well and had gained two pounds. The sinuses were small and discharging scantily.

The sixth dose, 2 c.cm., of the third autogenous bacterin was administered. He then went to the White Haven Sanitarium, where he had obtained a position, and has not been heard from since.

There are several points of interest in this case. In the first instance, as to the localization of metastatic tuberculosis in the ribs: the primary focus, of course, was in the lungs. Tuberculosis selects cancellous tissue of bone in preference to compact: witness the frequency with which it attacks the bodies of the vertebrae (Pott's disease); the carpal and the tarsal bones; the neck of the femur and the spongy acetabulum (coxalgia); and the upper and the lower extremities of the tibia (Brodie's abscess—though not necessarily tuberculous). Tuberculosis is usually determined to bone by a trauma. Thus, the ribs are exposed to frequent traumata not only directly from blows, but also indirectly by coughing, sneezing, lifting, and other strains. In these cases the infection is haematogenous, but in some cases probably travels directly along a rib by contiguity, the pulmonary tuberculous process being adherent to and involving the bony thorax. The disease in this case conformed to type in being insidious in onset, the patient reporting when the cold abscess became noticeable. Could he have been studied in the earlier stage, the rib would have been found thickened and slightly tender, and the clinical thermometer would have revealed an elevation of temperature, even though slight. A tuberculous abscess of the thoracic wall, particularly when situated posteriorly, in the scapular region, might be confused with a lipoma, in which the fat is at times so soft as to impart a sense of fluctuation. A lipoma, however, is connected neither to the overlying skin nor to the underlying thoracic wall, but is freely movable as a whole upon the thorax. So, too, an empyema may perforate spontaneously and take up a subcutaneous position: concomitant with such an abscess are signs of pleural effusion. In the aged, tuberculosis may so thicken a rib as to simulate a malignant tumor: subsequent softening with fluctuation, however, suggests the diagnosis.

Concerning the treatment of the cold abscess itself, aspiration under strictly aseptic conditions is the surest, safest, and most effectual method. Healing after aspiration differs essentially from healing after incision. With aspiration it is centripetal, but after incision commonly centrifugal, even when sinus formation does not ensue. The classic objection to indiscriminate opening of a cold

abscess is the great liability of secondary infection by pyogenic invaders. This probably explains why, in pre-antiseptic days, our forefathers were so strongly opposed to operative measures not only upon cold abscesses, but also upon surgical tuberculosis in general.

After aspiration, Beck¹ prevents secondary infection, as well as sinus formation, by injecting the cavity with a ten per cent. bismuth vaseline paste without suturing the opening or introducing a drain. In his series of one hundred cases, only one developed a severe secondary infection, and only four resulted in sinuses; there were no deaths. Ninety per cent. of cases closed within three weeks after incision and injection. Murphy's method of dealing with a cold abscess is referred to in Case 4.

The secondary invaders here were at first streptococci. The autogenous bacterin was made in the usual manner. The pus was smeared over the surface of an Agar slant. At the end of twenty-four hours' incubation, the fine, discrete, pin-point colonies, characteristically streptococccic, appeared on the slant. Having been duly identified, a twenty-four hours' crop on an Agar slant was scraped off into 10 c.cm. of normal saline solution, with which the Agar tube had been filled. Of this suspension, 1 c.cm. was placed into a bottle containing 9 c.cm. of normal saline solution and some glass beads. Having been standardized so that each cubic centimetre contained about 400,000,-000 organisms, the bacterin was placed in the electric shaker for fifteen minutes, and was then sterilized by immersion in a water-bath at 60° C. for half an hour. Trikresol, one-fourth of one per cent., was added as a preservative, and the bacterin stored in the ice-chest, ready for use. Three successive bacterins were made, the second culture showing the presence of staphylococci, which often follow in the wake of a streptococccic infection. That these bacterins were efficient in clearing up the pyogenic infection is evident from the history, and was shown by bacteriologic examination. Furthermore, by elimination of the pyogenic invaders the way was prepared for the employment of tuberculin therapy, in case the latter was indicated.

If, after resection of a tuberculous rib, the discharge persists for an undue period of time, it is probable that the focus has not been entirely removed. At operation even, a rib may appear healthy on

¹ *Ann. of Surg.*, 1914, lix, 145.

superficial inspection, and yet there is a focus of disease in the interior, which is responsible for the continuance of the discharge. As an earnest that every focus has been reached, the best method is to inject the sinus with Beck's bismuth paste and then take a skia-gram. The sinus and its labyrinthine ramifications are now entirely revealed and orientated. An example of such a case, in which an anatomic diagnosis was thus made, is cited by Beck.²

Tuberculin therapy has been employed for twenty-three years, and at present there are about twenty-nine tuberculins on the market. Despite this period of time, its curative power, at least in pulmonary tuberculosis, has never been definitely and incontrovertibly established. The strongest argument for its use here is that it hastens the disappearance of the tubercle bacilli in the sputum (Landis). In surgical tuberculosis, on the other hand, there is more unanimity as to its advantages, especially in children. The earlier, the less complicated, and the less febrile the case, the more suitable for tuberculin therapy. In tuberculous lymphadenitis, in which the lymph-nodes are swollen and hard and the von Pirquet reaction is strongly positive, tuberculin is especially indicated, but in conjunction, of course, with other measures. The tendency, nowadays, is toward such conservative measures and away from operative interference. Thus, of sixty cases of tuberculous lymphadenitis treated by Hawes,³ forty-six have had the disease arrested and are now well and healthy in every way, thirteen have been markedly improved, while in only two instances has the disease progressed despite treatment.

The preparation most widely employed is O. T. (old tuberculin, Koch's original, 1890), although some prefer T. R. (rest tuberculin, Koch, 1897), B. F. (broth filtrate, or Denys's tuberculin, 1905), and B. E. (bacillary emulsion, Koch, 1901). In the administration of tuberculin, the rules of Trudeau may be considered a standard. Here a dose is given once a week. The initial dose is 0.0001 to 0.0005 mg., rarely 0.001 mg. This is gradually increased up to 50 to 100 mg. Increase of dosage is gauged by careful observation of clinical signs of a reaction—local, focal, or constitutional (Hawes). Thus, in describing his method of tuberculin therapy, Murphy⁴ says:

² *Loc. cit.*

³ *Am. J. Med. Sci.*, 1913, cxlvii, 10.

⁴ *Murphy's Clinics*, 1913.

"The injection should be given in the afternoon, preferably at four o'clock. The temperature should be taken every two hours during the daytime for the succeeding twenty-five hours. The best opsonic index is obtained when the reaction on the afternoon following the injection is 99.6°. The temperature reaction is the guide to the size of the dose, which must be adapted to the individual case. If the reaction exceeds 99.6°, the dose must be reduced the next week. If the reaction is less than or just 99.6°, the dose may be increased the next week." White and Van Norman⁵ reported a method of determining, by means of a cutaneous reaction, the correct therapeutic dosage of tuberculin for subcutaneous injection. They showed that that quantity of tuberculin required to produce a reaction of 4 mm. on the skin, their so-called "minimal cutaneous reaction," will, when injected intradermically, produce a local reaction at the site of injection 2 to 5 cm. in diameter. They consider this quantity to be the optimum dose,—that is, the dose that will produce the most marked reaction without constitutional symptoms. Treatment is begun and continued for months with this optimum dose, instead of starting with a very small arbitrary dosage in order to produce a tolerance. This method has been tried by Cashman,⁶ who describes the technic and reports upon twenty-eight cases of surgical tuberculosis, chiefly of the lymph-nodes. Of the twenty-eight cases, eleven are considered as well, eleven improved, five unimproved, and one dead. He concludes that the variation in susceptibility of different individuals to the action of tuberculin is marked; that the correct therapeutic dose of tuberculin for any individual can be determined accurately by the cutaneous reaction; and that tuberculin therapy by this method is a valuable aid in the treatment of surgical tuberculosis.

It must not be forgotten that, as Murphy states, surgical tuberculosis is a general disease of which the bony, articular, or other lesions are local manifestations, and involves the necessity of treatment being undertaken on two lines—general and local. Of the usual measures of rest, fresh air, food, and sunshine, the last is the most important. In recent years good results have been claimed in tuberculosis of the lymph-nodes, bones, and joints by heliotherapy,—that is, by exposure of the focal process to the direct rays of the

⁵ *Arch. Int. Med.*, 1910, vi, 449; 1912, ix, 114.

⁶ *Am. J. Med. Sci.*, 1913, clxvi, 213.

sun. At first the exposures are for fifteen minutes three times a day, and later may be increased to three hours, morning and afternoon. Of 369 patients thus treated by Rollier, in Switzerland, 284, or 74 per cent., were cured; 48 improved; 21 uninfluenced; and 16, or 4 per cent., died.

By advances along these lines the ultimate results in surgical tuberculosis are constantly improving.

CASE 2.—*Tuberculosis Cutis: Excision.*—J. M., male, white, aged forty-two, reported at the Out-patient Department of the Protestant Episcopal Hospital, service of Dr. A. P. C. Ashurst, August 3, 1911, presenting the lesion shown in Fig. 1. Three months previously a growth like a pimple appeared from unknown cause in the skin over the left inguinal region, and has grown gradually to the present size. At no time has it been very tender. There has been no treatment until now. Under local anæsthesia (cocaine) it was excised and sent to the laboratory for examination. This was made by Dr. C. Y. White, who reported the presence of innumerable giant-cells typically tuberculous.

This little tumor might have been confounded with a benign skin lesion, a sarcoma, and possibly even a carcinoma. It might have been a metastatic deposit from some internal neoplasm. Consult Babcock's article on "Superficial Metastatic Growths in Diagnosis of Deep-seated Malignant Tumors."⁷ In the differential diagnosis, Sternberg⁸ calls attention to the fact that if the von Pirquet test is made near the skin lesion there will be no tuberculosis cutis on the fingers and hands of pathologists (*verruca neerogenica*, or anatomic tubercle) and of others who handle tuberculous tissues, and even of a house-wife. The most minute of these lesions is called a butcher's tubercle. After referring to the treatment with X-rays, with heliotherapy, with tuberculin, with iodine, with trypsin, and with copper salts, Bloodgood⁹ states that in his experience the most permanent treatment, and the one which accomplishes results in the quickest time, is local excision. Later on the regional lymph-nodes may be removed if they are enlarged and do not subside after the removal of the local area. Even entirely apart from any question of diagnosis, it is always good surgery to ablate isolated small cutaneous growths, particularly at this period of life, when it is possible to operate in the precancerous stage, for it has

⁷ *N. Y. Med. Journ.*, 1913, xcvi, 109.

⁸ *Centralbl. f. Chir.*, 1911, 735.

⁹ *Progressive Medicine*, 1913, iv, 244.

FIG. 1.



Tuberculosis of skin. A pea-sized nodule of unusual type and in an unusual location. (See Case 2.)

FIG. 2.



Diaphragmatic hernia at pars sternalis. The suspensory ligament of the liver leads into the orifice, which is situated behind a bifid ensiform process. The thumb-like extension of the pouch upward behind the costal cartilages and the sternum is indicated in dotted outline. (See Case 3.)

been shown that these little tumors are potential foci of malignancy. Should operation be refused, carbon dioxide snow and radium are efficient therapeutic agents.

CASE 3.—Diaphragmatic Hernia at Pars Sternalis: Anatomical Specimen.—Last year, in the anatomical laboratory of the University of Pennsylvania, I found a very interesting specimen of this condition in a well-developed male cadaver of about fifty-five years of age. The diameters of the orifice were, laterally, 4.5 cm.; anteroposteriorly, 1.5 cm.; whilst its depth was 6.5 cm. It was situated behind the middle of the ensiform, which measured 4 cm. in length and the same in width, and which was bifurcated (Fig. 2). Two fingers introduced into the orifice passed to the upper border of the right fourth costal cartilage, at its junction with the sternum. The boundaries of the pouch were thus found to be as follows: Anteriorly, the upper half of the ensiform and part of the gladiolus with the fourth, fifth, sixth, and seventh right costal cartilages; behind, the diaphragm arching upward and backward; on the left (which corresponded to the midline), a well-marked muscular slip which arose from the middle of the back of the ensiform and passed to the left and backward to be incorporated with the diaphragm; and, on the right, by a minute, weak, aponeurotic tendinous slip which arose from the right edge of the ensiform. Connected with the right and the posterior margin as far as its middle was the suspensory ligament of the liver. The entire pouch was lined by peritoneum and by the fat about the round ligament. The latter was situated 2.5 cm. to the right of the right boundary of the pouch, whence it passed obliquely up to join the right wall. The pouch contained omentum. On reflecting the sternum with the costal cartilages below the third rib, the sac was found buried in 1 cm. of loose, yellow fat (preperitoneal), situated between the pericardium behind and the sternum before, and overlapped by the lower border of the right lung.

This hernia occurred through the narrow interval between the two short, fleshy or aponeurotic bands which arise from the posterior surface of the ensiform and represent the sternal origin of the diaphragm. This interval is filled with areolar tissue, and is covered on the thoracic side by the pleura, and on the abdominal by the peritoneum. Surgically, it is a weak point—a potential atrium through which, as here, a portion of the contents of the abdomen may protrude into the chest, forming a diaphragmatic hernia, or a collection of pus may descend from the mediastinum, so as to point at the epigastrium. Because of the negative pressure within the thorax it is always the abdominal organs which pass through the opening. Named in order of frequency, these are the stomach, the colon, the omentum, the small intestine, the liver, the duodenum, and the kidney. Most of these hernias are left-sided.

Clinically, the condition may be recognized if the examiner be familiar with the symptoms and signs, which, while often very

clear, especially in traumatic cases, yet in congenital cases are often lacking, the malformation being found unexpectedly at autopsy. Although not cognizant of the life-history of this subject, yet, because the sac was small and contained but omentum, he could scarcely have suffered from disturbance other than that due to mild indigestion, with distress after meals, from tugging of the omentum—symptoms that are common in epigastric hernia. In the first instance, there must be ruled out the non-operative condition of chronic idiopathic unilateral elevation of the diaphragm, which was described by Petit in 1790, who applied the misleading term of "eventration" of the diaphragm. The literature does not show more than about twenty cases of this condition. In hernia the history of a severe trauma, whether a strain, a crush, a stab- or a gunshot wound, is of immense importance.¹⁰ The symptoms apt to arise sooner or later after such a trauma are, in a definite case, pain in the upper abdomen and the left chest, followed by dyspnoea and vomiting, and by dextrocardia, from the stomach or the bowel entering the chest. Here the X-rays are chiefly of corroborative value.

Giffin¹¹ concludes: "When, however, the injury has been less severe and the symptoms and signs less definite, and again in most cases of congenital diaphragmatic hernia, radiographic and fluoroscopic examinations must be relied upon for a differentiation of the condition. In interpreting the plates, (1) a destruction of the definite dome shape characteristic of the normal diaphragm line, (2) the appearance of lung tissue through the gas bubble in the left chest, and (3) the demonstration of bismuth in the colon above the level of the bow line of the chest constitute the most important evidence in favor of hernia of the diaphragm. By fluoroscopic examination the 'paradoxical respiratory phenomenon' may be demonstrated." By this phenomenon is meant that during forced inspiration the right diaphragm descends normally, while the boundary line in the left chest ascends, and that during forced expiration the right diaphragm ascends, while the boundary line on the left descends. Giffin appends to his article a bibliography of 187 references.

¹⁰ Lachner (cited by Riebel) compiled 266 cases of diaphragmatic hernia, and found the following etiological relationship: Open—37 due to stab-wound; 14 due to gunshot wound. Total, 51. Subcutaneous—35 due to falls from a great height; 7 due to burying accidents; 3 due to compression of the thorax. Total, 45.

¹¹ *Ann. Surg.*, 1912, i, 398.

Vogel¹² believes that diaphragmatic hernia is much commoner than is generally supposed, and that it may exist indefinitely without giving rise to symptoms. He reports an interesting case in which there were signs of colonic obstruction, with peritonitis, which ended fatally. The history included no symptoms that could be connected with the astonishing dislocation of the abdominal viscera which was revealed at the autopsy. On opening the thorax the colon was seen occupying the left chest through a left-sided diaphragmatic defect. The spleen was about in the position of the heart. The left lung was collapsed. The right lung was adherent to the chest-wall, but otherwise normal. The left border of the heart was 2.5 cm. to the right of the median line, the right border 11.5 cm. to the right of the median line, the upper border at the third rib, the apex at the sixth rib, 1.5 cm. inside the mammary line. The left chest was filled with omentum, *caput coli*, transverse and descending colon; a few inches of the ileum were lying above the diaphragm. The stomach lay above the diaphragm, with the duodenum passing through the opening. The hernia could be easily reduced. The hernial opening occupied the posterior and lateral portions of the diaphragm, was about 15 cm. in diameter, and had rounded and somewhat thickened edges. There was a stricture of the sigmoid 5 cm. long, so that even the little finger would not pass through the obstruction.

Referring to subcutaneous rupture of the diaphragm, Riebel¹³ says: "The diaphragm in man has an important influence on the heart's action, by its anatomic relation to the heart and pericardium. It is an important factor in the circulation by aiding venous return, especially from the abdominal cavity. It plays an important part in maintaining equilibrium in the thoracic cavity. Rupture of the diaphragm must needs be followed by serious disturbances in internal respiration and in the equilibrium within the thoracic cavity. The inevitable prolapse of abdominal organs following subcutaneous rupture still increases this condition. In cases of suspected subcutaneous rupture of the diaphragm, insufflation should be employed with low pressure (10 to 15 mm.) before operation, to overcome the deleterious effects of disturbed intrathoracic equilibrium."

The treatment of diaphragmatic hernia, when recognized as such,

¹² *Am. J. Med. Sci.*, 1913, cxlv, No. 2, p. 206.

¹³ *Surg., Gynec. and Obstet.*, 1913, xvi, p. 133.

is by thoracotomy by resection of the eighth and ninth ribs, as recommended by Permann and Postempski in 1889. The rent in the diaphragm may be sutured, or patched with a transplant of fascia lata. If the condition has been diagnosed first by exploratory laparotomy and the hernia cannot be dealt with through such an opening, it may be closed and thoracotomy proceeded with.

CASE 4.—*Osteomyelitis of Vertebra, Tuberculous (Pott's Disease); Psoas Abscess.*—J. W., male, colored, aged twenty-nine, stevedore, reported in the Surgical Out-patient Department of the University Hospital on April 1, 1913, stating that ten months previously he began to suffer from sharp pain down the front of the right thigh to the foot when occupied with particularly heavy lifting. Later he had pain in the right hip which disappeared and travelled to the left hip, where it is now located. He cannot work because of inability to stoop. There have been no fever, chills, or sweats. Temperature normal. He has lost some flesh; his regular weight before the onset of the present illness was 179 pounds, and now it is 162, a loss of seventeen pounds. He states that seven years previously he had a chancre, but no history of secondaries or of a course of specific treatment was obtainable. The Wassermann reaction was negative. Clinical examination revealed a good range of flexion and of extension in the spine. There was tenderness on pressure on the fifth lumbar spine. A slight, diffuse swelling existed over the right sacro-iliac joint, and above this and just behind Petit's triangle is an enlarged lymph-node. Rectal examination negative. Anteriorly, there was a fluctuating cystic tumor saddled beneath the inner half of Poupart's ligament. The skiagram showed caries of the fifth lumbar vertebra and disease of the right sacro-iliac joint. The psoas abscess was tapped below Poupart's ligament, and odorless, thin pus was aspirated, which proved to be negative on bacteriologic examination. He was referred to the surgical ward for rest in bed with extension.

The only symptoms in this case were pain, disability, and loss of weight. The signs were tenderness over the fifth lumbar spine, slight bulging over the right sacro-iliac joint and over Petit's triangle, and a fluctuating, painless abscess in the right iliac fossa. It was by combining these symptoms and signs—even though each of itself be insignificant—that the clinical diagnosis was made. Suggestive were the race and the age; and corroborative, the evidence afforded by the X-rays and the cold nature of the abscess, the sterility of which was demonstrated bacteriologically. The slow and insidious onset of the disease was characteristic of tuberculosis. The pain, which was a prominent feature, afforded a margin of error in the old, familiar pitfalls of "lumbago," lumbar myositis or fibrositis, and sacro-iliac sprain. As a matter of fact, it is not unlikely, from the nature of the patient's work, that the last condition may have determined tuberculo-

sis to the part. White says of this: "The fact that the bodies have to bear the chief strain of such shocks and of extreme flexion and extension, the most usual forms of spinal injury, serves, together with their comparative vascularity, to make them the seat of tuberculous infection when it invades the spine."

The pathology of Pott's disease is simple. It is a tuberculous osteomyelitis of the cancellated bodies of the vertebrae. *Bacillus tuberculosis*, carried either by the blood-vessels or by the lymphatics, lodges either in the periosteum or in the bone, where it institutes cellular proliferation, with the production of definite tubercle nodules. The usual giant-cell systems appear in the nodules, enlarge and caseate, with concomitant absorption of the osseous trabeculae. When the tubercles reach a certain size, nourishing pabulum can no longer reach their centre, with the result that the classical tuberculous degeneration known as caseation occurs. By extension of this process and absorption of the trabeculae, caries or softening of the bone results, and cavities lined by tuberculous granulation tissue are produced. This tuberculous attack upon the body of the vertebra now has two telling effects. In the first instance, provided that the anterior portion of the body has been involved—which is usually the case—the weight of the superincumbent spine upon the rotten bone causes collapse, just as when a weak scaffolding gives way. Instead of the uninvolved vertebrae above and below being parallel with each other, they form an acute angle, which opens posteriorly, and thus there arises, first, a straightening of the lumbar curve, which is normally concave backward, and, secondly, and particularly in the thoracic region, an angular kyphosis, or "humpback." The other effect of the tuberculous attack is that the caseated areas, at first minute and confined to the centre of the tubercles, soon coalesce, with the formation of a lake of granular, amorphous material, composed of caseous débris, pus-cells, etc. Thus there arises a lumbar or psoas abscess which must seek room for itself. The natural outlet is the psoas muscle, which arises chiefly from the bodies of all the lumbar vertebrae, and is enclosed in a tubular sheath of fascia. It is this compartment that the cold abscess enters and follows downward under Poupart's ligament, usually to the outside, but occasionally, as it gets lower down, to the inside of the femoral vessels. If it does not perforate the fascia lata at the upper

part of the thigh, it may travel beneath it to the lower third of the thigh, the knee, or even to the leg or ankle. It may also work backward, pointing in the angle between the erector spinae muscle and the twelfth rib; or, if lower, along the border of the erector spinae; or, if farther out, at Petit's triangle, as in this case. It may even traverse the great sacrosciatic foramen and appear in the gluteal region.

If treated, healing takes place by the absorption of the caseous material and its replacement by, first, granulation tissue, and next by fibrous tissue, which may undergo calcification. If, on the other hand, the disease progresses, it may compress the anterior common ligament, and successively the dura mater, the arachnoid, and the pia mater, and then the nerve-rootlets. The accumulating tuberculous material compresses the spinal cord and produces ascending and descending degeneration. These effects may also be produced by the angular kyphosis, with displacement. In the case of the odontoid process, such displacement may be the cause of sudden death by compression of the bulb.

As to the symptoms of Pott's disease, backache is the most important, not only because it is often the first symptom, but also because it is so commonly slighted. There is probably no bodily ailment for the cause of which examination is least likely to be made as backache, which is often called by that meaningless term "lumbago," which so admirably proves that there is nothing in a name. This has been previously emphasized by the author in *INTERNATIONAL CLINICS*, vol. iii, Series 23, p. 210, in discussing the causes of backache. Instead of being regarded as a bagatelle—as something to be slurred over—every backache should be as welcome to the examiner as the friendly sign-board at the crossroads. The pain being made worse by motion, and early fixation of the spine, are other early and significant symptoms of Pott's disease. The early fixation is due to contraction of the spinal muscles. It is in keeping with Hilton's law for the protection of diseased joints, and represents Nature's method of splinting. Voluntary rigidity, also, appears, the patient in his movements being careful not to bend the spine and thus cause pain. When kyphosis, lordosis or scoliosis, according to whether the anterior, the posterior, or the lateral portion of the vertebra is involved, appears, the disease is fairly well advanced. Not only is it more creditable, but more favorable to the patient's early recovery, to

diagnose the case on the basis of the earliest symptoms and signs.

As of value in determining very early changes, Calvé and Lelièvre¹⁴ recommend *lateral* skiagrams in Pott's disease. They state that marked thinning of the intervertebral disc affected is the most constant early finding, and occurs simultaneously with such presumptive clinical evidence as localized contracture and slight difficulty in gait. Further advantages of the lateral view are that it shows accurately the extent of the lesion; that it indicates the most useful orthopaedic procedure; and that it may be ascertained when a cure has been obtained.

In the differential diagnosis *acute suppurative osteomyelitis of the spine* must be taken into consideration. An instance of this, with copious clinical notes, has been reported by Ashhurst and Wadsworth.¹⁵ Tscherniak¹⁶ brings the total number of reported cases up to sixty-five. Usually the lumbar region is affected. In most cases the *vertebral arch with its processes* is the seat of the disease, while in tuberculosis the *body* is usually affected. Angina, furuncle, or whitlow may be the primary focus of infection. Bacteriologically, *Staphylococcus pyogenes aureus* is most frequently found. Usually the disease begins *suddenly with severe symptoms*, so that the patient may be semi-conscious from the onset and a diagnosis is difficult for a few days. Later, the pain along the spine directs attention to that region. The prognosis should always be guarded on account of the frequency of metastases. The mortality is 41.5 per cent. Treatment must be operative. It must not be forgotten that *syphilis* may produce vertebral lesions and simulate Pott's disease. Particularly true is this of the lesion called vertebral osteo-arthropathy, or Charcot's disease of the spine, which occurs in *tabes dorsalis*. Here the vertebrae are compressed and reduced in height and enlarged laterally, and the intervertebral discs are thickened and ossified. In this malady pressure symptoms are apt to arise from the hypertrophic osteitis. Jones¹⁷ reviewed the literature and found thirty cases, in addition to two of his own.

The treatment of Pott's disease is summed up by Murphy as fol-

¹⁴ *Am. J. Orth. Surg.*, 1913, xi, 193.

¹⁵ *INTERNATIONAL CLINICS*, vol. iii, Series 23, p. 214.

¹⁶ *Dissertation*, Königsberg, 1913: in *Internat. Abstr. of Surg.*, Feb., 1914.

¹⁷ *Am. J. Orth. Surg.*, 1913, x, No. 3, 363.

lows: "Relieve pressure and relieve tension; prevent mixed infection, check the disease, and bring about the absorption of the disease products." In the absence of angulation, prolonged rest in bed, plenty of fresh air and of nourishing food, and a course of tuberculin are indicated. If there is a tuberculoma pressing upon the cord, decompression by performing laminectomy is indicated, the gap between the ends of the divided laminæ being filled with a strip of erector spinæ muscle, which gives to the pressure of the cord and permits it to expand backward, and also prevents future compression of the cord by the growth of new bone from the ends of the divided laminæ (Murphy).

As to the treatment of kyphosis during the active stage of Pott's disease, a remarkably efficient operation has been devised by Albee, which marks a distinct advance in the surgery of the spine. It is based upon the old principle that absolute immobilization is the *sine qua non* in bringing about healing of a tuberculous focus. The object is to produce a bony fixation and to prevent the irritation of motion and of crushing of the vertebral bodies, and thus stop the progress of the kyphotic deformity and of the tuberculous process. This is gained by transplanting an autogenous bone-graft from the shin into the space left by splitting longitudinally the spinous processes of the vertebrae, the supraspinous and the interspinous ligaments. By spanning the diseased vertebrae and one or two normal ones, above and below, utilization of the full length of the spinous processes as levers over the transverse processes as fulera is obtained, thus holding the involved segment of the spine in hyperextension. The graft itself has a splint action, and acts under the mechanical advantage of being pulled upon lengthwise, thus preventing kyphotic deformity. Furthermore, the field of operation is superficial, posterior to the spinal cord, and distal to the focus of disease, so that there is no danger of encroachment upon the spinal canal by overgrowth of bone or infection. The vertebral column is thus anatomically well constructed for this method, and no normal anatomical structure or support of the spine is severed or destroyed, but, on the contrary, taken advantage of.

The technic of the operation is comparatively simple. A semi-circular incision begins at the midline above the diseased area, and passes outward, downward, and inward, reaching the midline again

below that area. This semilunar flap of skin and of superficial fascia is reflected to the opposite side, thus exposing the tips of the spinous processes and the supraspinous ligaments. The scalpel is passed so as to split the supraspinous and the interspinous ligaments longitudinally in the midline, care being taken not to separate them from their bony attachments. Using a chisel, the spinous processes are now split longitudinally in halves to a depth of about three-fourths of an inch, and greenstick fractures are made of the halves on one side and always on the same side, leaving the halves on the opposite side intact to preserve leverage. The neural arch is a safe guide in preventing too deep penetration, and the sound of the mallet and the chisel indicates the approach to it. After estimating the length of the graft with a flexible probe (it must span the diseased vertebræ and one or two normal ones above and below), the wound is packed temporarily with a hot saline compress, and attention turned toward obtaining the bone-graft.

With the leg flexed on the thigh, a sufficient incision along the crest of the tibia is made down to the bone, and the skin, the superficial fascia, and the deep fascia are carefully separated from the periosteum of the anterointernal flat surface of the tibia. The periosteum is incised deeply where the saw is to travel. With a sandbag against the popliteal space and the calf of the leg, a long and thick prism-shaped piece of the tibia, covered above with periosteum and underneath with marrow, is removed with a chisel or motor saw. The tips of the graft are sliced off slantingly, lest sharp corners be left to traumatize the skin. The periosteum of the graft is incised obliquely, to improve the blood-supply to it, as well as to let out the active osteogenetic cells from the periphery of the bone-cortex: this also prevents the graft from growing in length. In children, where it is desired that the graft grow, the periosteum is incised crosswise. The compress is now removed and the bone-graft inserted into its bed between the split spinous processes and the divided ligaments, and is held in place by sutures of strong kangaroo tendon, which are inserted through the supraspinous ligaments so as to draw them together. The operation is completed by suturing the superficial fascia and the skin. The after-treatment consists in keeping the patient on a fracture-bed or a gas-pipe frame for from six to ten weeks.

The implants have varied from four to seven and one-half inches in length, three-eighths to one-half inch in width, and one-quarter to one-half inch in thickness. Their corrective force has varied from simply embedding a straight graft to a reshaping of the graft to somewhat approach the deformity, and then forcibly to bend this shaped graft into its bed and fasten its ends into position. In order to bend the splint, it is held in two clamps and notched with the motor saw for a depth of one-half to two-thirds on its concave side. The graft never breaks. Infection does not necessarily impair the vitality of the graft.

The results of Albee's operation have been excellent. All pain has disappeared in every case no later than the third day, and rapid improvement in the general condition has been striking. In every case of paraplegia the paralysis has cleared up in less than six months. Skiagrams taken fifteen months after operation showed union of the graft to the spinous processes and increased bone proliferation about the implant and the tips of the spines, the bone detail of the bodies after several months being clearer. In 108 cases there has been no mortality.

Of the methods of dealing with cold abscess, that of Murphy seems best. That the abscess should not be opened unless the primary focus at the bottom of it can be reached and cleaned out is a long-established principle in treating surgical tuberculosis. The reason for this is that the secondary infection that may follow is more virulent than the simple tuberculous, and that absorption of the septic products may lead to general infection. Murphy's method is first to prevent the absorption of septic products by coffer-damming the regional lymph-spaces. This is accomplished by the injection of a two per cent. solution of formalin in glycerine at least twenty-four hours old. The formalin produces a polynuclear leucocytosis and also stimulates the formation of connective tissue. The cold abscess is aspirated not at its most dependent point, as in the case of pyogenic abscesses, lest a permanent sinus be formed, but at the point of least pressure, which is at its uppermost portion. Having withdrawn the pus, it is replaced by an almost equal quantity of the formalin-glycerine solution, which goes to the bottom of the cavity because it is heavier in specific gravity than the fluid of the pus. The aspiration may be repeated within a week if necessary. If after this the open-

ing of the abscess be indicated, it may be performed with the least likelihood of secondary infection arising.

Follin's figures show that fifty years ago from fifty-six to sixty per cent. of all psoas abscesses operated upon died from secondary infection. The prognosis as to the ultimate outcome and also the duration of time necessary to effect a cure may be gauged by the extent of the lesion, particularly as shown in the lateral view in a skiagram. No changes pointing to cicatrization are visible before two or three years, and the time necessary for osseous consolidation, which is the last stage of repair, may be considerably longer.

The above résumé of the newer treatment of Pott's disease has been written at length in the hope that cases will be recognized earlier and submitted to the operation, which at present offers the best result for the patient. In its preparation acknowledgment is due the writings of Beattie and Dickson, of Murphy, and of Albee.

CASE 5.—*Tuberculosis of Ilium, with Sinus of Thigh.*—W. M., male, aged ten, schoolboy, reported at the Surgical Out-patient Department of the University Hospital on August 8, 1913. He had a sinus on the right thigh, near the greater trochanter, which was discharging pus, and which had been treated for some time as an ordinary subcutaneous abscess. Suspecting disease of the innominate bone, a skiagram was requested. This revealed caries of the body of the ilium, just above the margin of the acetabulum, tuberculous in type. The patient was sent into the House service of Dr. John B. Deaver, and the focus was duly removed.

Quite an interesting chapter could be written upon the surgical anatomy of the fascias and their influence upon the course of deep abscesses. That a psoas abscess may point as far down as the ankle has been demonstrated in the preceding case. The present case is mentioned just to show how one may be led astray in the diagnosis if the roaming tendency of sinuses be not borne in mind. The fascia lata, or deep fascia of the thigh, is attached above in an irregularly circular manner to the margin of the innominate bone and certain of its ligaments, forms an almost unbroken sheath around the thigh, and is attached below to the lateral borders of the patella and to the tibia, and posteriorly is continuous with the deep fascia of the leg. It is of sufficient strength and density everywhere to influence the course of abscesses and to modify the surface appearance or feel of deep growths. A lipoma beneath the fascia lata may apparently have the density of a malignant growth (White, in "Piersol's Anatomy").

It is not necessary to detail here the various places at which abscesses from the innominate bone may point; suffice it to say that in this case the pus made its way from the bony focus through the gluteal muscles to the vicinity of the greater trochanter. I can recall at least two cases of tuberculosis of the shoulder-joint in which the pus took as its guide one of the normal openings of the capsule—that formed by the entrance of the long tendon of the biceps brachii muscle into the joint—and pointed at the anteroexternal portion of the arm about four inches below the joint. In both instances the patient was treated for some time for an ordinary subcutaneous abscess, and the diseased joint was entirely overlooked.

It is not uncommon to find sinuses about the anus that closely simulate, and are often attributed to, fistula in ano, but which are really due to a focus of osteomyelitis in the sacrum, vertebræ, or in the innominate bone. Thus, Beck¹⁸ mentions a patient who had been operated upon five times without success for supposed rectal fistula. By injections of bismuth paste, followed by a skiagram, the sinuses with several side tracks were seen reaching from the rectum directly up to the eleventh and the twelfth thoracic vertebræ, where the disease originated. This method is of the utmost value in rendering an anatomical diagnosis of the extent of a chronic suppurating sinus, and it shows the irrationality of probing or attempting to dissect a sinus. Sinuses on the cheek, the result of dental caries, I have seen treated as boils. Sinuses on the finger-tips, at the bottom of which is a sequestrum yearning for exhumation, are often treated for prolonged periods under the belief that they should heal spontaneously. A sinus on the sole of the foot, which is really not a sinus at all but a perforating ulcer, is also not infrequently treated without a realization of its true pathology. Such illustrative cases could be multiplied indefinitely, but the commonest errors have been pointed out.

Another interesting feature which has to do with the surgical anatomy of fascias is the course effusions of blood in fracture take. Unless the bone be very superficial and covered by loose tissues, as in the case of the bones of the face, it takes several days for ecchymosis to appear. A good example of how blood travels until it finds either a natural opening in the deep fascia, or one through which a blood-

¹⁸ *Loc. cit.*, 148.

FIG. 3.



Fibrolipomata of thigh. That on the left thigh is the larger, being the size and the shape of a pear; its base is pedunculated and its end ulcerated. That on the right side is the size of a marble. (See Case 6.)

FIG. 4.



Ossifying traumatic myositis of thigh. A gossamer-like ledge resembling early callus appears to jut out from the femur, but closer inspection shows its isolation from the periosteum by a clear, linear streak. (See Case 7.) It is instructive to compare this illustration with Fig. 6.

FIG. 5.



Syphilitic osteoarthritis of knee. The girth of the right knee is two inches more than that of the left, the swelling being chiefly about the internal condyle. Note the distended tributaries of the saphena. (See Case 8.)

vessel escapes, is seen in hemorrhage beneath the palmar or the plantar fascia, the ecchymosis appearing after a few days at the webs of the fingers, between the branching digital slips of the fascia. A similar condition is found in fracture of the base of the skull, posterior fossa, where the blood effuses beneath the dense, deep fascia, and, following the perforation in it for the passage of the posterior auricular vessels to the surface, appears within three or four days as an ecchymosis at the tip of the mastoid process. This is Battle's sign, and is of much practical diagnostic value.

CASE 6.—*Fibrolipoma of Thigh: Ablation.*—C. W., female, white, aged fifty-four, presented at the Surgical Out-patient Department of the University Hospital on September 1, 1913, with a tumor on the upper and inner portion of each thigh. Of these, that on the left thigh is the larger, being the size and shape of a pear; its base is pedunculated, and its end ulcerated (Fig. 3). It had been present for twelve years, and was a source of great annoyance to the patient. That on the right side is the size of a marble. Using novocain-suprarenin local anæsthesia, the skin at the base of each tumor was infiltrated, incised elliptically, and the tumor ablated. Microscopical examination by Dr. John Speese revealed fibrolipoma.

The chief clinical interest in lipomata is concerned in their diagnosis, and in their liability to recur in certain situations. While rare in the scalp, owing to the imprisonment of the fat-pellets in rigid fibrous compartments, yet I recall ablating a fibrolipoma from the scalp which could not have been differentiated clinically from an old sebaceous cyst with a thick wall, or from a dermoid. Certain lipomata about the neck and in other situations where confusion may arise are so fluid in consistency that, considered apart from findings elsewhere in the body, they simulate closely cold abscess, and exploratory puncture is necessary for differentiation. Lipomata in the inguinal canal and at the saphenous opening may mimic hernia. In the thigh, lipomata in the superficial fascia often travel downward from gravity, owing to their loose connections in the soft fat; while if beneath the fascia lata (subfascial), as mentioned above, they may seem to have the density of a malignant growth, because flattened out and confined. Deep in the upper portion of the thigh in young children congenital lipomata occur and may assume malignant aspects.

That lipomata are not always benign, as commonly considered, but may become malignant, is shown by the case of malignant lipoma

reported by Bériel and Delachanal.¹⁹ A woman was admitted with a large tumor on the posterior aspect of the right thigh, of one year's duration. Operation disclosed its origin from the sheath of the sciatic nerve; it weighed three kilos (about six and one-half pounds). Six months later metastases were present in the lumbar lymph-nodes and in the fatty capsule of the left kidney, causing lumbar and sciatic pain. At the second operation the left kidney, part of the tumor, and the lumbar lymph-nodes were removed. A year and a half after the first operation the patient died in a cachectic state. Autopsy showed an involvement of the right lumbar fossa, the omentum, the right lung, and the intermuscular cellular tissues of the neck. Histological examination of these different tumors showed that they were of lipomatous origin, both in the case of the primary tumor and in that of the metastases. At certain points there were myomatous and sarcomatous characteristics, which were interpreted as indicating a lack of differentiation. The diagnosis was of a malignant lipoma, as opposed to that of sarcoma with lipomatous evolution. These tumors arise from the fatty connective tissue and ordinarily, as opposed to the benign lipomata, their stroma is very cellular. These cells develop fatty vesicles, but in atypical cases the sarcomatous appearance becomes predominant and the fatty origin of the tumor can be diagnosed.

In an article that reviews the whole subject of fatty conditions in the body, Finney²⁰ states that lipomata may occur in any situation, even in the heart and the brain.

In operating upon lipomata that are superficially situated, care must be directed toward obliterating the dead space left after their removal, else the absence of tension will bring about the formation of a haematoma, which means a longer period of healing, as well as the possibility of infection. This is avoided either by obliterating the cavity by deep sutures which approximate the floor to the roof, or else by the firm pressure of a compress. Lipomata may be connected with the periosteum, particularly of the skull, the scapula, and the spine. It is essential in these cases to remove absolutely all traces of the tumor, excising the periosteum if necessary, for other-

¹⁹ *Arch. de Méd. exp. et d'Anat. path.*, 1912, xxiv, p. 717, abstr. from *Jour. de Chirurg.* in *Internat. Abstr. of Surg.*, 1913, iv, 280.

²⁰ *Bost. Med. and Surg. Journ.*, 1912, clxvii, p. 495.

wise recurrence is very apt to take place. There is a retroperitoneal diffuselipoma, which is clinically semi-malignant, and which tends to recur after partial extirpation. Complete extirpation is not possible.

CASE 7.—*Myositis Ossificans Traumatica of Thigh.*—J. D., male, white, aged fourteen, messenger, reported at the surgical clinic of the Polyclinic Hospital, service of Prof. Morris Booth Miller, December 8, 1913. He stated that three weeks previously he was run over by a wagon, the wheel passing over the right thigh just above the knee. Clinical examination revealed an elongated mass resembling soft callus, the upper end of which was flexible. It was situated in the vastus internus muscle. The clinical diagnosis was as per caption. The skiagram (Fig. 4) revealed the picture characteristic of this condition: a clear linear streak is seen between the ossifying area and the periosteum. Expectant treatment was instituted, no operation being performed, but the patient was advised to report again for examination.

A strikingly parallel case was admitted last year to the Ancoats Hospital, Manchester, and was reported by Morley in an excellent article on the subject in the *British Medical Journal*, Dec. 6, 1913, p. 1475. It concerned a male, aged twenty, a green-grocer's assistant, who, three weeks previously, was run over by a wagon, the wheel passing over the front of the left thigh. At first he noticed nothing wrong, but shortly afterward, on bending the knee, felt a sudden pain in the lower third of the thigh, and this was followed almost immediately by swelling, which became considerable. The skiagrapher reported a "faint subperiosteal deposit of bone, irregular in shape, that might be due to a periosteal sarcoma." At operation a large haematoma was evacuated lying under and in the crureus muscle. At the bottom of the cavity the femur was covered by a layer of new bone, which averaged 2 cm. in thickness, and from it blunt spikes and bars projected irregularly into the muscle and the cavity of the haematoma. The new bone was soft, and presented exactly the appearance of three-weeks-old callus. The mass, together with the periosteum, was removed with the gouge. *Within three weeks a definite recurrence, much larger than the original growth, took place.*

Before discussing the subject more in detail it is just as well to emphasize the two salient points about myositis ossificans. The first is, *be sure you are not dealing with a periosteal sarcoma*; and the second, *do not operate unless disability exists, and then do not be satisfied with simple excision, for recurrence usually ensues.* Concluding that the cause of the recurrence was the destruction of peri-

osteum and loss of its function as a limiting membrane for the osteoblasts, Morley decided to remove the recurrent bone and transplant a piece of iliotibial band onto the denuded femur, to fulfil the double function of preventing recurrence and preventing adhesions of muscle to the denuded bone. This plan was carried out with complete success, function being restored and skiagrams taken four and eight weeks after operation showing entire freedom from recurrence.

As to the second point, the danger of mistaking myositis ossificans traumatica for a periosteal sarcoma is a very real one, and doubtless many limbs have been unnecessarily sacrificed by not recognizing the benign nature of the malady. Both lesions may arise after trauma, immediately or following an interval. According to Bloodgood, if the myositis is seen early, before bone forms, it cannot be differentiated positively from sarcoma, except at the exploratory incision; and in cases in which the bone formation in the muscle extends to the shaft of the neighboring bones it may be difficult, even with the skiagram, to differentiate the lesion from a periosteal osteosarcoma.²¹ As to the question of the possibility of sarcomatous degeneration of myositis ossificans traumatica, probably the only case in literature is that reported by Coley.²² This occurred in a female, aged twenty-six, who, eight years previously, suffered a contusion of the lower part of the thigh. Two years later an exostosis was found, and three years after this Coley explored and proved by histologic examination that there was no sarcoma, and the diagnosis of myositis ossificans traumatica was confirmed. Three years later the patient began to suffer pain, and exploratory operation with histologic examination showed what was diagnosed giant-cell sarcoma, but what Bloodgood, in commenting upon the case, regarded as a very malignant mixed-cell sarcoma containing giant-cells. The patient died about eight months after amputation with symptoms of metastasis.

Traumatic intramuscular ossification is the term suggested by Morley in lieu of myositis ossificans traumatica—a name that is objectionable as implying a theory of its pathology for which, he shows, there is little foundation. He states that this condition follows

²¹ *Prog. Med.*, 1913, iv, 259.

²² *Annals of Surgery*, 1913, lvii, 305, with bibliography.

the infliction of a single severe contusion, and must be distinguished clearly from two other types of intramuscular ossification,—namely, (1) *myositis ossificans progressiva*, which starts early in life, usually in the muscles of the back, and ultimately causes death from respiratory failure; and (2) ossification into tendons, the result of slight, repeated mechanical irritation, such as "Rider's bone."

The locations in which traumatic intramuscular ossification is liable to develop are remarkable and interesting. Thus, Schultz, quoted by Makins,²³ collected from the records of the German Army in ten years 233 cases, of which *all but three were situated in the quadriceps or brachialis anticus*. In certain recorded cases almost the whole of either muscle has been infiltrated with bone. Most of the patients are young adult or adolescent males who have been exposed to a severe subcutaneous contusion, usually a kick on the front of the thigh or a blow with a fist on the front of the upper arm. In both these situations there is a broad, smooth, convex area of bone, covered by periosteum that is loosely attached and readily stripped off, owing to the absence of tendinous insertions. In the light of these facts and of his own investigations, Morley considers the pathology of traumatic intramuscular ossification to be as follows: A severe blunt injury at once subcutaneously strips off and destroys the periosteum and crushes the muscles in contact with the bone. Bleeding occurs from the surface of the denuded bone, and, with the blood, osteoblasts in a free and possibly amœboid condition escape into the pulped muscle tissue and blood and there produce a growth of bone. As Macewen has shown, healthy muscles left in contact with denuded bone form protective fibrous adhesions from their interstitial connective tissue, and so take on the limiting function of the periosteum. But *severely-contused* muscle tissue mixed with blood, so far from restraining the migration and growth of osteoblasts, provides a very favorable pabulum for them.

As to prognosis without operation, growth usually ceases after a number of months, and reabsorption to a certain extent occurs. Disability, due to interference with locomotion, may ultimately give way under exercise to perfect restoration of function, although it may be a matter of months or of years.

* *Proc. Roy. Soc. Med.*, 1910-11, iv, 134.

CASE 8.—*Osteoarthritis of Knee: Syphilitic.*—H. N., male, white, married, aged twenty-four, hatter, reported at the Surgical Out-patient Department of the University Hospital, June 13, 1913. He stated that eighteen months previously the middle of the right thigh had been squeezed between the running-boards of two cars, and that for the last four months there had been swelling at this site, with moderate disability in the use of the knee. He had been treated for a month in two other hospitals by the classical method of rest and extension by Buck's apparatus without the slightest benefit. Clinical examination revealed moderate effusion into the joint and a thickening of the lower third of the thigh, but no acute inflammatory signs. The urine was clear. Suspecting syphilis, blood was taken for a Wassermann test, which proved strongly positive. Skiagram showed periosteal osseous proliferations about the lower third of the femur. The patient was immediately given modern syphilitic therapy. On July 6, 1913, after eighteen days of active treatment, I received the following letter from the patient:

“DEAR SIR: In reply to your letter of inquiry in reference to my knee, I wish to state that it is improving wonderfully. There is no pain at all, but there is still a little swelling ; but this is nothing compared to what it was when I first came to hospital. I will stop over at the hospital and let you see for yourself how it is getting along. Thanking you for the treatment you ordered for me,

“Respectfully yours,

“— —.”

A nearly parallel case was referred to me October 3, 1913, by Dr. Benjamin F. Buzby, of Swedesboro, N. J. It concerned a male, white, aged thirty-seven, who three months previously worked in a pit, and a week later noticed pain in the right knee-joint, followed by swelling. This pain was osteoscopic, the annoyance commencing at midnight with great regularity. Clinical examination showed that the girth of the right knee was two inches more than that of the left, the swelling being chiefly about the internal condyle (Fig. 5). There was no preternatural mobility ; no floating of the patella. The urine was clear. Skiagram (Fig. 6) showed fogging of the outline of the femur, for a distance of four inches above the level of the adductor tubercle, by shaggy, proliferating osteoperiostitis. The Wassermann reaction was positive. Specific therapy was instituted.

In a paper entitled “*Syphilis and the Surgical Outpatient,*” Coues²⁴ writes: “The statement that the surgical out-patient clinic of a large hospital is one of the best places in the world to study syphilis would not, perhaps, be granted by many, but at the same time it is perfectly true. Some of the most obscure and interesting lesions are there, minutely exhibiting themselves and begging for notice, often to no avail. . . . If we seek to ascertain what types of

²⁴ *Bost. M. and S. J.*, 1913, clxviii, 508.

FIG. 6.



Skiagram of right knee of preceding figure, showing fogging of the outline of the femur, for a distance of four inches above the level of the adductor tubercle, by shaggy, proliferating osteoperiostitis. (See Case 8.) It is instructive to compare this illustration with Fig. 4.

FIG. 7.



Obliterating thrombo-angiitis of the lower extremity. The characteristic trophic ulcer beneath the nail of the great toe exposes the end of the ungual phalanx. (See Case 10.)

FIG. 8.



Leg of preceding figure. Shows incision made to expose the cutaneous division of the musculocutaneous nerve at its emergence from the deep fascia. The scar has formed, but its lips are edematous. (See Case 10.)

lesions are most often unrecognized, few would contradict the statement that gummata of the bones and specific osteoperiostitis were among the most frequent." I cite this because it coincides with my own experience. A little working paraphrase that has helped me through with many a case is: "If in doubt, suspect syphilis!" That is, if there is anything atypical about the case, if it is a little different in its appearance or in its course from anything you have ever seen or read of before, suspect syphilis! That this is a matter of great importance is attested by the following statement of Bloodgood: "In the past few years I have had opportunity to see three patients with luetic osteoperiostitis *who would have lost their limbs on the diagnosis of sarcoma had they consented.*"

In an analysis of one hundred cases of acute arthritis among negro laborers on the Panama Canal, Baetz,²⁵ excluding traumatic arthritis, arthritis occurring during the course of pyogenic infections, and arthritis frequently seen in disseminated tuberculosis, found that 63 per cent. were cases of syphilitic arthritis. In 93.6 per cent. of these 63 cases the Wassermann test was positive. In the white wards of the hospital, however, syphilitic arthritis is, proportionately, very much less common. As to what stage of syphilis the arthritis usually belongs, owing to the high percentage of positive Wassermann reactions—a percentage not attained in tertiary lesions—as well as to the rapid recovery under appropriate treatment, without impairment of function in almost all cases, Baetz concludes it is a late secondary rather than a tertiary manifestation. The joints usually involved are the knees, elbows, sternoclavicular, ankle, and wrist. The symptoms are not those of acute but of subacute inflammation. There is no fever and no constant pain—only the osteoscopic pain, mostly nocturnal but occasionally diurnal, if the patient work by day. Locally, there is moderate swelling, but absence of marked effusion, the joint being merely boggy. There is tenderness on pressure. Baetz states that the most reliable concomitant sign of syphilitic arthritis was acute osteoperiostitis of the sternum and of the long bones, especially of the lateral surface of the tibia.

As to the differential diagnosis, syphilitic and traumatic osteoperiostitis, with or without bone formation, may be difficult to distinguish from periosteal sarcoma, with or without bone formation,

²⁵ *Jour. A. M. A.*, 1913, **lx**, 1065.

in the early stage. All usually follow trauma. "In the beginning there is little difference in the clinical history and finding. The longer the lesion is present, the less the difficulty in differentiating the sarcoma from the benign lesion in the X-rays. But at this period the sarcoma is well advanced. I have never seen the sarcoma early. In my cases of periosteal osteosarcoma there has always been some destruction of the cortical bone beneath the periosteal growth. This is not present in traumatic ossifying osteoperiostitis, and, when it occurs in syphilis, it is a late sign, when, as a rule, the clinical signs of the luetic periosteal gumma are evident. The therapeutic test is valuable: a positive Wassermann reaction, followed by intravenous salvarsan, will immediately have an effect upon the luetic osteoperiostitis. If not, exploratory incision for diagnosis should be made at once under an Esmarch, and prepared for the radical operation when sarcoma is found. I have not seen any cases of periosteal sarcoma giving a positive Wassermann reaction." ²⁶

In both of my cases the lesion was an osteoarthritis; that is, it probably began as an osteoperiostitis in the articular portion of the bone, and involved the joint tissues secondarily, the affection of the joint masking the bone lesion. In hereditary syphilis an epiphysitis may be masked (Fournier). In other cases, particularly in the late tertiary, the synovial membrane, the cartilages, and the ligaments may be involved. This is just a step into the pathology of a Charcot joint, which will be considered below. Traumatic intramuscular ossification, mentioned above, cannot come into question, since it does not involve the joints. In a paper entitled "Differentiation of the Diseases Included Under Chronic Arthritis," Barker ²⁷ presents an excellent classification of the arthritides, together with many suggestive observations bearing upon the diagnosis, both clinical and Röntgenographic. In isolating a case of syphilitic from the maze of other arthritides, volumes might be written on the differential diagnosis, but in the last analysis this will be settled by the Wassermann reaction, and, in the small percentage of cases in which the latter is negative, by the therapeutic test. While other signs of syphilis may be present, it may not occur to the observer to look for them. There is an indescribable, intangible something about a

²⁶ Bloodgood, *Prog. Med.*, 1913, iv, 236, 278.

²⁷ *Am. Journ. Med. Sci.*, 1914, cxlvii, 1.

patient afflicted with syphilis that arouses my suspicions of lues more than anything else. When available, a Wassermann reaction should be a routine procedure in joint affections, and many surprises will be discovered. The literature on the subject of syphilis of the joints is meagre, and the subject bears revision based on advances in our knowledge of syphilis since the employment of the Wassermann reaction. The latest contribution on the subject of syphilis of bones and joints is by Boorstein,²⁸ and includes a report of ten cases, together with a bibliography. He states that it is said with assurance that more patients are afflicted with syphilis of the bones and joints than are reported in the literature, and that many cases of bone syphilis are unrecognized or diagnosed as tubercular, the reason being merely that we have not enough signs as yet by which to recognize this affection early. He gives a classification and a description of the hereditary and acquired forms of bone and of joint syphilis. Patients may have diffuse syphilitic osteomyelitis which does not show on the skiagram. "Bone blisters" occur in late hereditary syphilis, and appear in skiagrams as small areas of rarefaction with a cap of dense bone raised above the line of the normal shaft. In the diagnosis we must remember that syphilis shows a productive osteitis, while tuberculosis usually shows a rarefying osteitis. In some cases it is hard to distinguish it in the skiagram from acute osteomyelitis or healed tuberculosis. The prognosis is good, so far as relief from pain and restoration of function are concerned, but changes in bone structure will still be found in the skiagram on future examinations.

CASE 9.—*Charcot Joint of Knee; Pathological Intercondylar Fracture of femur (L).*—J. R., male, white, aged fifty, single, boiler-maker, reported at the Surgical Out-patient Department of the University Hospital, February 4, 1913. He stated that eight weeks previously, while walking up the kitchen steps from the yard, the left knee suddenly bent outward, giving two sharp snaps. *There was no pain in the knee after the injury, and there has not been any since.* He was taken to a hospital, where examination showed ecchymosis along the posterior and outer aspects of the thigh; floating of patella in extensive effusion; crepitus; and painless preternatural mobility of leg on thigh throughout normal radius of joint-motion and inward 30° beyond normal limits. Wassermann reaction weakly positive ($\frac{1}{4}$ unit). Then an operation was performed through an internal incision: complete reduction of the deformity was impossible, and the fragments were secured by two long screws. The diagnosis was intercondyloid fracture of the left femur and tertiary syphilis. One month after the operation, and before leaving hospital, he was given 0.9 Gm. of neosalvarsan intravenously.

²⁸ *Surg., Gynec. and Obstet.*, 1914, xviii, 46.

When he came to the Surgical Dispensary of the University Hospital the disproportion between the trivial injury and the size of the bone that was broken suggested pathological fracture, while the complete painlessness pointed toward a Charcot joint. After a hasty examination I made the following notes: "Pupils sluggish to light, but normal to accommodation. Teeth carious. Right patellar reflex lost (Westphal's sign). Left knee-joint in varus position, and there is still enough effusion to float the patella: circumference about middle of patella $16\frac{1}{2}$ inches on the affected side, and 14 inches on the right. Patient states that there is occasionally a darting pain down the right leg, but that at no time has there been any pain in the left knee. He says that he cannot hold the urine very long, and that he may have to get up at night, sometimes two or three times." A Wassermann reaction was requested, and Dr. Laird reported that it was medium positive ($\frac{1}{2}+$ unit). He was then referred to the Nervous Clinic for an examination, and Dr. Spiller reported: "Diagnosis of tabes justified by the sudden fracture, then diminution of sexual power, then incontinence of urine; diminution of tendon reflexes in right lower extremity; delayed pain sensation; impaired vision, and suggestion of a beginning optic atrophy." He was accordingly given a course of mercury (sublimate) and iodide of soda, with an occasional injection of neosalvarsan. A brace to support the knee was devised by Dr. deForest Willard. The last annotation on the history was entered under date of August 29, 1913, when the Wassermann reaction was still weakly positive ($\frac{1}{4}$ unit). It should be added that Dr. J. W. McConnell also examined this patient in the Nervous Clinic and reported: "We believe the case is one of tabes of unusual type." To complete the examination of the case, the cerebrospinal fluid should have been subjected to the Wassermann reaction.

Discussion of this case might well be made in the first instance from the standpoint of pathological, sometimes called spontaneous, fracture. In this type the bone is so softened by disease and so weakened that the time comes when it gives way from a very slight trauma. There are many conditions that may cause this, the range being from osteomyelitis through syphilis to metastatic neoplastic involvement. *Fragilitas ossium* is a different matter, and fracture by muscular violence does not signify that the bone is diseased. The

severity of the vulnerating force, therefore, should always be carefully investigated. Painlessness should at once arouse the suspicion of tabes. In my case the skiagram showed irregular proliferations about the knee-joint. As mentioned in the preceding case, such proliferations should at once call for a Wassermann reaction. The anaesthesia is due, of course, to the blocking of the pain-impulses on their way from the periphery to the brain by the shrivelling up of the cells of the posterior horn of the spinal cord and of the substantia gelatinosa Rolandi which caps the posterior horn. It is around these cells that the neurones of the first order terminate in the cord. Some, however, pass from the spinal ganglion on the posterior root directly up the column of Goll or of Burdach to the medulla oblongata, and therefore are not so liable to be involved. Brian Metcalfe²⁹ reports the case of a man, aged forty, who, while stepping off a stationary tramcar, felt something give way in his right arm. *There was no pain, but the arm immediately became powerless.* He was treated in a hospital for five weeks, the arm being placed upon an internal angular splint, and was then discharged. When the reporter examined him, there was a fusiform swelling about the lower third of the right humerus. Crepitus was easily obtained, the fragments being extremely mobile; *movements caused no pain*; X-ray examination showed an almost transverse fracture of the lower third of the humerus, no overlapping, no comminution; a good deal of callus was present. He gave a definite history of syphilis. Diagnosis was made of a spontaneous fracture due to a gumma. During the next four months the following treatments were tried without success: (1) Gypsum case and iodide and mercury for six weeks: no union. (2) Operation of excision of false joint, insertion of a plate with four screws, and internal angular splint for a month: no union. (3) Administration of thyroid extract, five grains twice daily; increase of iodide to 100 grains per diem; applications of Martin's bandage for three hours twice a day; daily massage: after two weeks, still no union. It was not until 0.6 grammie of neosalvarsan was administered intravenously six months after the accident, and an operation performed a week later, at which the plate was removed, another false joint that had formed excised, two plates inserted, one anteriorly and one externally, and the arm put on an internal angular splint,

²⁹ *Brit. M. J.*, 1913, i, 339.

that bony union was obtained and was complete at the end of four weeks. Five months after the second plating the patient stated that his arm was strong and well, and that he had never felt better in his life. This case is instructive not only in showing how syphilis is often overlooked but also how powerless we are to cope with it at times without salvarsan: in obstinate cases even repeated doses of the latter drug are impotent.

In the treatment of the tabes, which furnishes the soil upon which the Charcot arthropathy thrives, it may be well to consider the suggestive observation of Viton.³⁰ The finding that reactivation of the permeability of the pleura was an indispensable element in the cure of pleurisy suggested that the non-permeability of the meninges was the cause of the ineffectual action of drugs in cerebrospinal syphilis. By inducing a slight chemical irritation in the meninges they are rendered permeable. For this purpose he injects into the spinal canal a mixture of 0.1 Gm. of mercuric cyanide, 0.015 Gm. of novocain, and 2 Cc. of 5 per thousand salt solution, and repeats it a month later, pushing mercury or salvarsan in the interim. The improvement in gastric crises or lightning pains has been constant and marked.

In an important paper entitled "Charcot Joints as an Initial or Early Symptom in Tabes Dorsalis," Taylor³¹ reaches the same conclusions that might have been drawn from a consideration of my case, which was treated before his paper appeared. These are:

- (1) Charcot joints and spontaneous fractures are often initial or early symptoms of tabes dorsalis.
- (2) They often precede the ataxic gait, and are of diagnostic importance in calling attention to the underlying tabes.
- (3) Charcot joints are frequently of traumatic origin, and often follow fractures and lesser injuries.
- (4) The results of orthopædic treatment in early or moderately-advanced cases of Charcot joint are extremely satisfactory.
- (5) Orthopædic treatment by protective splinting should also be used in the loose joints of tabes due to hypotonus before the appearance of swelling and effusion.
- (6) As ataxia is frequently one of the later symptoms to appear,

³⁰ *Semana Medica*, Buenos Aires, 1913, I, 1393, Abstr. in *Journ. Amer. Med. Ass.*, 1914, Ixii, 582.

³¹ *Jour. A. M. A.*, 1913, Ixi, 1784.

the term "locomotor ataxia" to designate the affection is misleading and should be discarded. "Tabes dorsalis" should be used in its stead.

Of the twenty-three cases upon which Taylor's paper was based, twenty-one were in men and two in women. The ages ranged from twenty-nine to fifty-seven. The syphilis was acquired between the ages of eighteen and twenty-five. Charcot joint appeared usually from fifteen to twenty years after infection: shortest time, seven years. Wassermann reaction always positive in absence of specific treatment. These are types of "low" tabes,—that is, without Argyll-Robertson pupil, but with slightly sluggish light-reflexes and absent knee-jerk, and in which there is often for many years serious bladder trouble without ataxia and without further symptoms: not one has shown a clean-cut picture of tabes (Cotton, in discussion). Romberg's sign should not be omitted here, for it is usually present. Skiagram may be negative at the onset of the trouble, but later shows roughened and fuzzy outlines and neoplastic osteogenesis, and finally bone absorption from pressure, and bone atrophy. The deformity, as described by Taylor, is usually that of a large, loose joint filled with fluid, with the increased play and displacements due to a stretched capsule and eroded articulation. The knee is the most frequent site, but the other joints of the lower extremity may also be involved. Of the seventeen knees, out-knee was noted five times, in-knee five times, and hyperextension seven times. There was one case of the *pied tabétique* of Charcot. As to treatment, the classic mercury-iodide course *per se* is ineffectual, but repeated doses of salvarsan may relieve some of the symptoms, and especially the shooting pains. Tabetic fractures usually heal after splinting with a large callus. Tabetic joints should not be operated on.

The diagnosis, which I consider the most important thing in Charcot joint, I have purposely left for the last. The treatment may not accomplish much, but a correct diagnosis will save many a limb from being amputated for sarcoma, and therefore avoidance of exposure to the mortality of hip-joint amputation. How many times this operation has been performed by mistake will never be known. I have seen it advised in at least two cases, in both of which it was abandoned after a fortuitous diagnosis at the last moment.

Cotton says: "I see a great many of these cases under different circumstances in a general surgical clinic, and they are usually those that my colleagues let go by. They are not the bad instances of Charcot joints, and had previously been treated with more or less Christian Science methods. They are unrecognized cases. The patients come in for unexplained joint injuries that are supposed to be traumatic. They are sometimes recognized after the failure of some method of treatment."

CASE 10.—*Thrombo-angiitis Obliterans (Buerger's Disease) of the Lower Extremity, with Relief of Pain by Neurectomy.*—M. L., male, Hebrew, aged forty-two, sheet-metal worker, presented at the Surgical Out-patient Department of the University Hospital, service of Dr. B. A. Thomas, July 17, 1913, complaining of intense pains in both legs of a year's duration. The pain in the left leg is greater, and is constant, night and day. It is chiefly burning in character.

Examination revealed both feet involved in ischaemia, obliteration of pulse of dorsalis pedis on both sides, and a dusky blush involving both great toes. A trophic ulcer beneath the nail of the left great toe exposes the end of the ungual phalanx (Fig. 7).

Nerve-stretching had been performed in another city without relief, and everywhere the patient went amputation was advised as the only method of relief from the wearing pain. Examination of the distribution of the pain showed that it was confined chiefly to the area presided over by the cutaneous filaments of the musculocutaneous nerve. It was figured out that if this nerve were resected, amputation could be postponed indefinitely and the patient allowed to retain the otherwise useful limb—at least until extensive development of gangrene indicated amputation. Accordingly, using a solution of novocain two per cent. with adrenalin 1 to 3000, intradermic infiltration along a transverse line two inches broad, with centre over antero-external border of fibula, was made four inches above the base of the fibular malleolus (Fig. 8). The cutaneous division of the musculocutaneous nerve was exposed at its emergence from the deep fascia, and a section one inch long was excised. The relief from the burning pain was *immediate*. The wound was drained by a folded strand of silkworm gut. It was closed by four silkworm gut sutures, and a dilute alcohol dressing applied.

The day after operation there was no pain in the foot. Reports upon the blood and the urine, which had been previously collected, showed that the Wassermann reaction was negative and that there was no sugar. The patient was given five drops of a saturated solution of the iodide of sodium and one one-hundredth of a grain of nitroglycerin three times a day after meals.

Owing to the impoverished circulation of the limb, the operative wound remained indolent for several weeks, but was eventually stimulated to heal by the application of Bier's powder of nitrate of silver and powdered clay.

A month after operation the patient complained of pain in the distribution of the anterior tibial nerve to the adjacent sides of the great and of the second toes. This nerve was reached in the first interosseous space by a hypodermic needle, and was blocked with alcohol. This sufficed to relieve the pain.

FIG. 9.



Chronic osteomyelitis of tibia (Brodie's abscess).
Skiagram in lateral view revealing an area of osteoporosis, the size of a dime, 5 cm. below the line of the knee-joint, midway between the anterior and the posterior border, and 2.5 cm. behind the tubercle of the tibia.
The outline of the area involved has been touched up to afford sharper definition. (See Case 11.)

FIG. 10.



Chronic osteomyelitis of tibia (Brodie's abscess). In the respective views the arrows indicate the pea-sized area of rarefaction one-half inch above the lower end of the malleolus, hinder part. (See Case 11.)

Thrombo-angiitis obliterans of the lower extremity is the designation proposed by Buerger³² for the condition formerly known as "endarteritis obliterans," "arteriosclerotic gangrene," and "*Spontan-gangraen*" of the Germans, and is based upon conclusions drawn from pathological studies of the vessels obtained from nineteen amputated limbs. In brief, we are dealing with a thrombotic process in the arteries and the veins followed by organization, and not with an obliterating endarteritis. Most of the larger arteries and veins of the amputated limbs were found obliterated over a large extent of their course. The veins share equally with the arteries in the lesion of occlusion, and may even be more extensively involved. The distal parts of the vessels, rather than the proximal, are closed. At times, two to four inches of a vessel's length is closed, while the portions above and below are apparently normal. There is often an involvement of some of the smaller branches, such as the tarsal and the metatarsal, but the smallest arteries are free. The process involves the intima, the media, the adventitia, and the perivascular tissues. The periarteritis is a fibrous agglutinative process that binds together the artery and its collateral veins and sometimes also the accompanying nerve, so that the liberation of the individual vessels by dissection is difficult. The cause is probably partly static and partly toxic.

The disease usually attacks Polish and Russian Jews between the ages of twenty and thirty-five or forty years, so that the names juvenile and presenile gangrene have been employed. After longer or shorter periods, characterized by pain, coldness of the feet, ischaemia, intermittent claudication, and erythromelalgic symptoms, evidences of trophic disturbances appear which finally pass over into a condition of dry gangrene. The left leg is usually the first to become affected, and when simultaneously bilateral the diagnosis of Raynaud's disease is often made. In the pendent position a bright red flush comes on the toes and foot. Soon a blister, hemorrhagic bleb, or ulcer develops near the tip of one of the toes, usually the big toe, and frequently under the nail, and when this condition ensues the local pain becomes intense. Even before the gangrene, at the ulcerative stage, amputation may become imperative because of the intensity of the pain.

³² *Am. J. M. Sci.*, 1908, n. s., **xxxvi**, 567.

In a case of thrombo-angiitis obliterans with frank gangrene of the right great toe, Lilienthal³³ made an arteriovenous anastomosis in Hunter's canal, using Carrel's method. After a month there was great improvement, and the skin had resumed its natural color. When the toe was amputated, there was the unusual spectacle of considerable bleeding from spurting vessels. After six months the foot was quite normal in appearance, and *there was no more pain*. In the discussion McWilliams stated that one advantage of such an anastomosis in this condition was that in case amputation subsequently became imperative it could be done lower down than otherwise.

CASE 11.—*Osteomyelitis of Tibia: Chronic (Brodie's Abscess)*.—C. F., male, aged twenty-nine, white, married, tailor, reported at the Surgical Out-patient Department of the University Hospital, July 21, 1913. He stated that fifteen years previously he had slipped on a banana peel, bruising the left shin but not breaking the skin. This was followed by osteomyelitis, which was operated upon (1) soon after the injury, (2) nine years ago, (3) six years ago, and (4) two weeks ago. Complete healing after each operation. Clinical examination revealed an old scar over the upper portion of the left tibia, with roughening of the surface of the bone. A recent spot of tenderness was found over the inner surface of the head of the tibia (internal tuberosity). Clinical diagnosis, Brodie's abscess. Skiagram (Fig. 9) revealed in the lateral view an area of osteoporosis, the size of a dime, 5 cm. below the line of the knee-joint, midway between the anterior and the posterior border, and 2.5 cm. behind the tubercle of the tibia. *The antero-posterior view was negative*. Referred to House for operation.

Another case is that of R. D., male, aged twenty, white, lathe operator, who three years previously, while working in the coal mines, began to have pains in the right foot, both when on and off the feet. Of late has had pain at times over the right internal malleolus. Clinical examination showed periosteal thickening over this area. The urine was cloudy and contained shreds. No tubercle bacilli were found in the sputum. Wassermann reaction was negative. Clinical diagnosis, Brodie's abscess. Skiagram (Fig. 10) reveals an area of rarefaction one half-inch above the lower end of the tibial malleolus, hinder part. Referred to House for operation.

Brodie's abscess is a chronic abscess that involves the cancellated extremities of the tibia, and rarely of the femur and the humerus. It is sometimes tuberculous in origin. It is commonly supposed to involve only the upper end of the tibia, but reference to Brodie's original article, entitled "An Account of Some Cases of Chronic Abscess of the Tibia," which was read on March 27, 1832, before the Medical and Chirurgical Society of London,³⁴ shows that his

³³ *Ann. of Surg.*, 1914, lix, 303.

³⁴ *Med. Chir. Tr., Lond.*, 1832, xvi, 239-240.

first observation was made in October, 1824, upon a case that involved the *lower end* of the right tibia, two to three inches above the ankle-joint. The limb was amputated, and, finding upon examination a cavity the size of an ordinary walnut filled with dark pus, Brodie concluded that a trephine of the bone would have saved the limb. He encountered the next case in 1826, two years later. This involved the *upper end* of the tibia, two inches below the knee-joint. Upon trephining, two ounces of pus were removed. The third case involved the *lower end*. Three additional cases are reported in the *Lancet*, 1838-1839, i, 690, of which one involved the upper and two the lower end. Thus, of the first six cases of Brodie's abscess that were reported, *four involved the lower end, and only two the upper end*. It is therefore hard to account for the prevalent idea that the disease is one necessarily of the upper end of the tibia.

The most important feature of Brodie's abscess is its recognition. When it becomes active and produces toxic symptoms, it may be completely overlooked as a cause of the trouble, and over and over again an infection, such as typhoid fever, is at first suspected as the *fons et origo mali*.

Professor Perthes, of Tübingen, according to Crile,³⁵ operated for abscess in head of tibia as follows: He first made the usual skin incision and sawed the healthy bone toward the knee until he was certain he had passed over the focus of osteomyelitis, when he turned up a long skin flap as one turns up an osteoplastic flap of skull. The focus was then cleaned out with a chisel in the usual manner, the cavity being filled with Mosetig's iodoform mass. The bone flap was turned back and nailed down without drainage. The nail was driven straight through the skin. That perfect results were secured by this operation was shown by the skiagrams of patients taken several years afterward.

For the privilege of studying most of the cases upon which this paper is based the writer is indebted to Professors Morris Booth Miller and B. A. Thomas.

³⁵ *Clev. Med. Jour.*, 1914, xiii, 18.

Progress of Medicine

During the Year 1913

BY HENRY W. CATTELL, A.M., M.D.; JAMES W. WALK, A.M., M.D.
AND
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SUPPORT OF THE PROFESSION

HENRY S. PRITCHETT (*Jour. A. M. A.*, March 8, 1913) gives a report of the Carnegie Foundation for Advancement of Teaching, which presents some things which are striking, even startling. In order to grasp the significance of the statements made, we must have in mind the ratio borne by physicians to the population as a whole. In the U. S. Census the word "physician" has a comprehensive sense including members of the so-called medical sects and taking in those who practise surgery and the specialties of every sort. Examination of the census for the years 1880, 1890, 1900, and 1910 shows that for the thirty years included between the first date and the last the increase in the number of physicians kept step quite closely with the growth of population. The averaged ratio was one doctor to six hundred inhabitants, and the variation from decade to decade was less than thirty above or below this six hundred. Note that these thirty years cover the period of the doubling of the length of the curriculum, the substitution of clinical and laboratory work for much of the didactic instruction, and other revolutionary changes in medical education.

That, in spite of these radical alterations, the ratio has remained constant, proves that the innovations have not as yet notably affected the supply of new men whose entrance makes good the falling off in numbers caused by death, disability, and voluntary retirement. That this influx has continued so large is disproof of the prophecy made by the late Dr. William Pepper and other promoters of the new medical education. They predicted that it would in a very few

years reduce the surplussage in the profession and end, once for all, the evil of overcrowding. For the information of those not familiar with the controversy over the lengthened college course, it should be said that the progressives denounced overcrowding as the primary evil in the situation then existing: an evil just as harmful to the general public as to the profession. Dr. Pepper, whose far-famed address in the year 1878, marked the beginning of a new era, strenuously contended that the profession cannot maintain the character and ability required by the interests of the public, unless there is enough legitimate professional work of a remunerative description to give its members adequate support. The aggregate pay for legitimate work will not properly maintain more than half the men already in the ranks; therefore, some are driven to illegitimate practices and many more are depressed to low levels of efficiency by harassing poverty. He argued that, from a financial view-point, the profession had become undesirable, and that, if entrance to it were made more difficult, many men would consider the preliminary cost too great, in proportion to any probable future reward, and would turn to other vocations of greater promise. The logical result would be such a great decrease in the number of students that in a few years a normal ratio would be established, to the great gain of the profession and even greater gain of the people, whose lives and health would be conserved by a body of men learned, skilful, and honorable.

The prediction was not fulfilled; decade followed decade; still the crowd of students held its own and the ratio to population continued constant. But everything comes to him who waits. At last the continuing exactions of longer time and a larger expenditure of money, together with more rigid requirements by the State examining boards, are showing palpable results. The fence enclosing the medical profession has become so high that many would-be climbers survey its altitude and turn away, concluding regretfully that they must seek some vocation of easier entrance. The report of the Carnegie Foundation shows that eight years ago, when the investigation of medical education was undertaken, there were in the United States and Canada 166 schools granting medical degrees, and their students numbered 28,142. In eight years the number of schools dropped to 117 and the total enrolment of students to 18,412. It is very interesting that among both schools and students the decrease has been just

a little less than one-third. The schools which closed their doors were mainly those which could not afford to provide the laboratory and clinical facilities now required, and those whose students, being too poor to pursue the longer course, gave up the study. A considerable number of students did not stop when the schools they were attending disbanded, but went to some of the surviving colleges, and yet the falling off among students was almost exactly the same as among schools. This demonstrates that the strong colleges lost many of their undergraduates. Suppose a thousand men from the 49 defunct colleges matriculated elsewhere, the fact that they produced no increase in the aggregate enrolment shows that the surviving schools lost a thousand of their former students. These were undoubtedly driven away from the profession by the rapid increase of requirements.

That the student body should shrink one-third in less than a single decade is a fact which justifies the appellation of startling. It appears to have no parallel in the entire history of education. If the shrinkage should continue at the same rate there would be, in 1921, a little over twelve thousand medical students, and in the following census year, 1930, less than eight thousand. This would mean that in thirty years following 1900, with a probable increase of 50 per cent. in the population at large, the number of students of medicine would show a decrease of 75 per cent. It is not likely that the falling off will be nearly so large as this. The medical schools now in operation have adapted themselves to the changed conditions and can survive, unless further exactions are made, and maintain their classes at nearly the present size; but one feature of the outlook is ominous. The standard is still rising; several States are making a hospital year compulsory, and there is much talk of a five-year curriculum. Such a change would inevitably cause a continued shrinkage of marked extent.

Weighing all the probabilities, it seems likely that during the next decade the enrolment of students will average about 17,500. What annual output of licensed physicians will this number yield? Since some of the schools have a four-year and some a three-year course, we might use three and a half as a divisor, giving 5000 as the quotient; but obviously this number is too large. Some students die, some are disabled by illness, some are discouraged by lack of money, some fail at the college examination, and some are rejected by the State board. Fully ten per cent. should be deducted from the 5000, leaving 4500 as

the number who reach the goal of licensure. Is such an increment sufficient to supply the vacancies annually occurring in the ranks of the profession? It must be remembered that practically there is no source of supply except the colleges. For many years the men coming to us from Europe have been almost exclusively handcraftsmen and laborers. Physicians from over-seas are too few to affect the large totals with which we are dealing. The movement to and from Mexico is trifling, and, since Canada is included in this inquiry, our conclusions are not affected by the considerable migration taking place across the northern border of the United States.

No positive statement of the annual loss by the death, disability, and retirement of physicians can be made; but deductions based upon the average age, the expectancy of life, and other data, fix this loss at six per cent., or about 9000. From this it follows that as only 4500 will come in, while 9000 will go out, there will be an annual decrease of 4500. If population advances at the probable rate, this decrease will in fifteen years diminish the ratio to one-half of what it is at present; in other words, there will be one physician to 1200 people.

Such a condition would correct the overcrowding; a further change would entail a scarcity. A town of 12,000, under normal conditions, needs the services of ten doctors and can give them adequate support. An average payment of \$5 per capita provides annually a fund of \$60,000. Such a fund would not be apportioned equally among the physicians; any idea of that sort is misleading; but the fund as a whole would maintain a group of ten men on a higher plane than what now prevails. Should such a status be reached, the problem of the support of the profession would be solved, if a normal condition could be maintained. That condition, in the words of Laertes Conner, is this: "All cases of illness, injury, and defect requiring treatment, are treated by the members of the profession."

This is a matter of radical importance and, in contemplating the impending shrinkage of our numbers, we should consider whether it will favor or inhibit this condition. To-day, in spite of our excessive numbers, much of the business which should be ours goes to quacks, whom we have vainly tried to suppress by legislation; for they have become strongly organized under laws enacted for their benefit. If, as our number diminishes, more and more of our business passes to these outsiders, then will our scheme of lengthy and costly medical

education prove a deplorable failure; for the profession will be worse off than now, and the community will have suffered incalculable loss.

Perplexed by the uncertainties besetting the future, some men have proposed a scheme of paternalism, under which the entire business of physicians and pharmacists would be controlled and supported by the State. This proposition broaches many questions, sanitary, civic, social, and economic; but they are of merely academic interest unless the plan be shown to be feasible from the financial standpoint. Such showing has not been made. Mr. William G. Toplis (*INTERNATIONAL CLINICS*, vol. i, 23d Series) has illustrated his advocacy of the plan by showing how it would work in the city of Philadelphia. He puts his best foot forward, because such a scheme would be more popular in a large and rich city than in rural neighborhoods or in the agricultural States. He has apparently studied the matter more exhaustively than most writers, and he reaches the conclusion that the annual cost entailed by the scheme would be about \$7,500,000. Now, to provide that sum, it would be necessary to increase the present city tax rate 50 per cent. Surely every one familiar with the financial and political conditions of the city of Philadelphia knows that such an addition to the tax rate is wholly impracticable.

We may accept the postulate that for many years to come the practitioners of the healing art must be paid by those whom they serve. This being so, we should strive to secure that normal condition of our vocation which will at the same time give us adequate support and give the public efficient service. The attainment of this end is worthy of the best thought of the best minds in the profession. There are two helpful things, in gaining which we may all coöperate: (1) We must cultivate the most liberal mental attitude toward everything, no matter whence it comes, which may improve the healing art. Whatever is of real value in osteopathy and the other vagaries must be incorporated and utilized. To cure the vast array of human ills, all Nature must be our armamenta. Patients should no longer say: "I highly esteem my physician; but I want to try heterotherapy, which is quite foreign to his system of practice." (2) We must find and adopt better financial methods. Some people think we follow the discarded practice of the railroads, to charge all the traffic will bear; some bluntly say: "You extort all that is possible." The charge is false; but some color has been given it by the exorbitant fees paid to a few men, and the

profession has suffered in consequence. There should be a system in charging which would commend itself as just and reasonable, and surely there are among us men with the ability to devise such a system.

If wise plans are adopted, and there is hearty coöperation in making them effective, we will be able to retain the work we now have and to recover what has been both unwisely and unjustly taken from us. The situation, among many doubts, has one most hopeful feature. We have, in great measure, outgrown the jealousies and bickerings of earlier days; the profession is better organized and the fraternal spirit more prevalent than ever before.

DOCTORS IN AUSTRIA

In the Austrian Empire, one of the most conservative countries in Europe, the profession is facing changes; some of them similar to those taking place here, and others diametrically opposite (*J. A. M. A.*, April 19, 1913, p. 1240; May 3, 1913, p. 1375). Just as with us, so in Austria, the increased cost of living is not attended by any adequate increase in medical incomes. Except in some of the specialties, fees have remained stationary throughout most of the territory, and the effort of the societies to secure compensatory advance is stoutly resisted by the laity. At present the doctors number less than one in two thousand of the population—in our view, a very small ratio which in America would mean a very serious shortage in the medical aid desired and required by the public. Although the Austrian physicians have potentially such a large *clientèle*, their actual money reward is small; the average annual income being officially given as less than \$1000. One naturally concludes that as a business vocation medicine is less attractive than formerly; but, strange to say, the number seeking to adopt this calling has enormously increased. During the past nine years the number of medical students has risen from 2500 to almost 7000, or nearly a three-fold multiplication. During this same period the student body in the United States has fallen off a third, dropping from 28,000 to 18,000. Here is a striking contrast and one whose cause is hard to find. We can account for the decrease in our own student body by the raising of our standard of education. The Austrian situation might be explained if their standard had been lowered; but that has not occurred. Nor are men attracted to the profession by the hope of social advancement. No doctor gets that

in the land of the Hapsburgs. Even world-famous men like Lorenz are not in the highest rank of society.

There is an additional feature of the present condition which renders it still more puzzling. Although less than five per cent. of the Austrian population is of Hebrew birth, half the students now in the medical schools are Jews. What inducement have they to enter a profession where the money reward is growing smaller and will become still less with the entrance of the crowd of students now in the colleges?

THE SPECIALIST AND THE GENERAL PRACTITIONER

Poets are born, not made; and this adage applies with equal force to the making of the specialist in medicine, provided his environment be such as to develop his latent powers to their fullest extent. But what is a specialist? As in any other profession, trade, or calling, exceptional service to mankind is the keynote of what constitutes a competent specialist. Any one who knows more than his fellows and is willing to diffuse his knowledge for the benefit of mankind is a specialist in the true sense of the word.

Of the exceptional man, and the kind of training which will best fit him to fight life's battles in the practice of his chosen profession, we have little to say. A Gross or an Agnew may have had the simplest of all preliminary training and yet succeed; but a Lister, a Virchow, a Koch, or a Pasteur will have secured in his day and generation the highest education that his own or any other land can give.

The most successful men practising medicine to-day—now, alas! approaching the age when they are to be oslerized—are the ones trained in gross morbid anatomy at the postmortem or the operating table some thirty-odd years ago. To-morrow, even now, the man who is reaping fame and the reward of his labors in the way of ducats is the one who spent the major portion of his early days in the laboratory, 15 or 20 years ago, and subsequently turned his attention to the more practical side of medicine and surgery.

That specialism is on the increase few will deny. Two examples of the extent to which it is developing may be here cited. First, the insertion in the American Medical Directory of the American Medical Association, after the name of a physician, of a designation to

indicate that branch of medicine to which he devotes special attention; and, second, the foundation of the American College of Surgeons, fathered by such leaders as Murphy, Mayo, Crile, Finney, Matas, and Martin. Surely the Directory should name also the internist and the laboratory worker, and why not include that real specialty of medicine, dentistry, for the teeth are as integral a part of the human body as is the ear or the nose?

The up-to-the-second hospital of to-day represents the highest degree of specialism yet attained in modern civilization, not excepting the engineering feat which gives us the Panama Canal; but is not higher education rearing a structure so out of balance that it is doomed to fall from its own weight? The modern hospital has a nurse anaesthetist and nurses with "R.N." after their names desirous of entering into competition with the physician in the treatment of disease,—at first, it is true, only of the minor ailments. But once there was a camel, and so forth.

Two parties are always at work, testing the capabilities of a specialist,—his fellow-practitioners and a discriminating public. Many an aseptic barber-shop or a dairy from which certified milk is issued puts to shame a doctor's operating room; indeed, public opinion has been active in the past in moulding the technic of medical practice, and will surely increase its activity in the future. But things change over-night. Our brethren in England shed bitter tears in anticipation of contract practice, and awakened one fine morning to the fact that practically one-half of the entire population was to be let out at so much per head, with the prospect of a great increase in their incomes over that of former days, and no more bad debts! But what becomes of the hospital largely maintained by voluntary contributions, from which has developed the specialist of these days? Time alone can tell.

The specialist of to-day is too often made to order—no longer only in Germany, we are pleased to say—but by intrigue, his family connections, his wealth, and in other ways too numerous to mention. And what are the pitfalls of the specialist? Are they not legion? Addiction to drugs, the performance of a criminal abortion, the extremes of poverty and wealth. If the specialist cannot forge ahead in acquiring useful knowledge, and thus keep in advance of the rank and file of the profession, he is already a failure; for it should be his first

duty, as well as his greatest pleasure, to disseminate among general practitioners, by writings, teaching, and personal contact, the knowledge he already possesses, and thus make way for fresh pabulum to dispense to them in the future.

If our State boards cannot trust our State universities,—now, alas! too often controlled by politicians of the worst type,—to see that graduates in medicine are duly qualified to practise the profession for which the medical schools have been paid “to deliver the goods” in the shape of a medical diploma, then it should be made the function of State boards in the future to demand of the physician that he show just cause why his diploma should not be taken away from him if he does not keep up with the best thought of his day and generation.

But woe unto the specialist, hidebound to one narrow groove, who locks his knowledge within his own breast for pecuniary gain, and in the fulness of his arrogance and self-satisfaction makes no effort to better the lot of his fellow-practitioners! A well-known ophthalmologist once told a friend that he did not put all of his knowledge into his books or his teachings, for this would deprive him of the *clientèle* sent him by the profession at large!

Nothing can be more selfish than specialism carried to its highest and logical conclusion when accomplished at the expense of the general practitioner. The rapacity of the robber barons of old in the acquisition of wealth at the expense of the masses was as nothing compared with that of certain specialists and cliques of specialists in subsidized hospitals in holding on to the patients referred to them by their fellow-practitioners. Let it not be said, To him who hath a specialty shall be given the patients of the general practitioner, while to him that hath no specialty shall be taken away even the patients which he hath. Be not content with your present achievements, nor fail to develop your talent lying buried in a napkin. Every practitioner who cherishes high ideals and is diligent in the pursuit of his calling becomes more or less of a specialist along the lines in which he is interested. And may not this wider diffusion of knowledge bring a golden era in medicine by making the ardent specialist of to-day the general practitioner of to-morrow? For there is no more reason why there should be subsidized specialists than that a few men should acquire excessive property rights by utilizing for their

own profit the natural resources of a country which belong to all the inhabitants thereof.

THE AMERICAN COLLEGE OF SURGEONS

In November, 1912, the organizing committee of the Clinical Congress of Surgeons of North America invited 500 prominent surgeons of North America to organize the new College. The committee consisted of Edward Martin, of Philadelphia; Emmet Rixford, of San Francisco; John B. Murphy, Albert J. Ochsner, Franklin H. Martin, of Chicago; Rudolph Matas, of New Orleans; Charles H. Mayo, of Rochester, Minn.; Frederic J. Cotton, of Boston; George E. Brewer, of New York City; John M. T. Finney, of Baltimore; W. W. Chipman, of Montreal, and George W. Crile, of Cleveland.

The call of the meeting summarizes the work for which the committee was authorized:

1. It should formulate a minimum standard of requirements which should be possessed by any authorized graduate in medicine who is allowed to perform independently surgical operations in general surgery or any of its specialties.
2. It should consider the desirability of listing the names of those men who desire to practise surgery and who come under the authorized requirements.
3. It should seek the means of legalizing under national, colonial, state, or provincial laws a distinct degree supplementing the medical degree, which shall be conferred upon physicians possessing the requirements recognized by this law as necessary to be possessed by operating surgeons.
4. It should seek coöperation with the medical schools of the continent which have the right to confer the degree of M.D., under the present recognized standards, and urge these colleges to confer a supplementary degree on each of its graduates who has, in addition to his medical course, fulfilled the necessary apprenticeship in surgical hospitals, operative laboratories, and actual operative surgery.
5. It should authorize and popularize the use of this title by men upon whom it is conferred, and its use should especially be urged in all directories of physicians in order that the laity as well as medical men can distinguish between the men who have been authorized to practise surgery, and those who have not.

On May 5, 1913, the College was organized with 450 surgeons in attendance, and the five hundred invited were made founders and governors. The following by-laws were adopted:

- I. The name of the corporation is the College of Surgeons.
- II. The object of the College shall be to elevate the standard of surgery, to provide a method of granting fellowships in the organization, and to formulate a plan which will indicate to the public and the profession that the surgeon possessing such a fellowship is especially qualified to practise surgery as a specialty.

III. ORGANIZATION.—The corporation is to be known as the College. The College shall consist of all members of the corporation, to be known as Fellows, and shall vest the general management of the corporation in a Board of Governors, and the Board of Governors shall in turn vest the details of the management in a board of trustees, to be known as the Board of Regents.

IV. ADMINISTRATIVE PLANS.—1. The Board of Governors shall consist of the five hundred surgeons invited by the Organization Committee to serve as founders of the College and who have signified their willingness to act in that capacity. The individuals of the first Board of Governors shall also be known as the founders of the College of Surgeons.

This original Board of Governors shall be divided into three classes, to serve one, two, and three years. At the annual meeting in 1914, and at each succeeding annual meeting, the Fellows of the College shall elect fifty surgeons to membership in the Board of Governors, each for a term of three years. Thirty of these are to be elected from a list of nominations consisting of two members each, nominated by the following surgical societies and associations of North America:

American Surgical Association; Section on Surgery of the American Medical Association; Section on Obstetrics, Gynecology and Abdominal Surgery of the American Medical Association; General Surgical Division of the Clinical Congress of Surgeons of North America; Division of Surgical Specialties of the Clinical Congress of Surgeons of North America; American Gynecological Society; Southern Surgical and Gynecological Association; Western Surgical Association; Section on Surgery of the Canadian Medical Association; American Association of Obstetricians and Gynecologists; American Orthopedic Association; American Association of Genito-Urinary Surgeons; American Laryngological Society; American Ophthalmological Society; American Otological Society.

Twenty members shall be elected at large to represent surgeons of North America not affiliated with the above societies or associations.

The Board of Regents shall consist of twelve surgeons, members of the Board of Governors, elected by the Governors, these to be divided into three classes, whose terms of service shall expire in one, two, and three years. Their successors shall be elected each for a term of three years. Not more than three of each class of four shall be elected from one country. The Board of Regents is increased to fifteen in number by three officers of the Corporation, the President, Treasurer, and General Secretary. The two Vice-Presidents are ex-officio members of the board. The Board of Regents is the administrative body of the corporation, corresponding to a board of trustees in other corporations.

V. FELLOWSHIPS.—The Fellows of the College shall be graduates in medicine, who are legalized to practise medicine in their states and provinces, who have made an application for fellowship, such application to be endorsed by three Fellows of the College, one of whom shall be a member of the Board of Governors, and who meet the qualification requirements that shall from time to time be established by the Board of Regents, and who shall be elected to fellowship by the Board of Regents on recommendation of the Committee on Credentials.

All Fellows of the College shall be designated a Fellow of the College of Surgeons and shall be authorized and encouraged to use the letters F.C.S. after his name on professional cards, in professional directories, and in scientific articles published in surgical literature.

VI. FEES.—An initiation fee of \$25 shall be required of each member of the College on his election to fellowship by the Board of Regents. The annual dues will be \$5.

VII. DIRECTORY.—The Board of Regents shall issue each year a directory containing the names and addresses of the Fellows of the College of Surgeons, arranged by states, provinces, and colonies.

VIII. EXPULSION.—Any member of the College may be expelled for unprofessional or other conduct inconsistent with the rules and regulations of this corporation by a majority vote of the Board of Regents.

IX. STANDING COMMITTEES.—The Board of Regents shall elect the following standing committees: 1. Credentials. 2. Legislation. 3. Graduate Schools and Hospitals.

These by-laws were unanimously adopted with the provision that the Board of Regents should make any minor corrections deemed desirable and present such corrections for adoption at the next meeting of the Board of Governors.

Officers Elected.—President, J. M. T. Finney, Maryland; first vice-president, W. W. Chipman, Quebec; second vice-president, Rudolph Matas, Louisiana; treasurer, A. J. Ochsner, Illinois; general secretary, Franklin H. Martin, Illinois.

Board of Regents.—J. M. T. Finney, Maryland; A. J. Ochsner, Illinois; Franklin H. Martin, Illinois; George E. Brewer, New York; George E. Armstrong, Quebec; John B. Murphy, Illinois; Edward Martin, Pennsylvania; F. J. Cotton, Massachusetts; Herbert A. Bruce, Ontario; C. F. Stokes, Washington, D. C.; William D. Haggard, Tennessee; George W. Crile, Ohio; Robert E. McKechnie, British Columbia; Charles H. Mayo, Minnesota; Harry M. Sherman, California.

Selection of Fellows.—The prospective Fellows are to be divided into four classes. Classes A, B, and C are to be admitted without the formality of submitting to an examination.

The A class shall consist of founders of the College.

The B class shall consist of the members of the special surgical societies constituting the Congress of American Physicians and Surgeons and one hundred each, nominated by accredited committees, from the Surgical Section of the American Medical Association, from the section on Obstetrics, Gynecology and Abdominal Surgery of the American Medical Association, from the General Surgical Section of the Clinical Congress of Surgeons of North America, from the Division of Surgical Specialties of the Clinical Congress of Surgeons of North America, from the American Association of Obstetricians and Gynecologists, from the Surgical Section of the Canadian Medical Association, from the Southern Surgical and Gynecological Association, and from the Western Surgical Association.

The C class shall consist of surgeons of prominence of five years in the practice of surgery or a surgical specialty and who, in the opinion of the Committee on Credentials, are eligible for fellowship in the College without formal examination.

For all others, coming under Class D, it was resolved that the Board of Regents, through the Committee on Credentials, limit the admission of the Fellows to classes A, B, and C until the Board of Regents formulates a standard of requirements for class D and reports the recommendations back to the Board

of Governors for approval at the meetings to be called by the Board of Regents in Chicago, November, 1913.

Applications for Fellowships.—It will be the spirit of this association to open the fellowship to all competitors in surgery without favor. Scientific attainments, surgical ability, unquestioned moral character, measured by the College's standards, shall constitute the measure for fellowship.

There are many hundreds of surgeons on the continent who are not included in classes A and B, who fall into the C class. Applications from these men will be welcome and their names will have the most careful consideration by the Committee on Credentials.

All applications for membership should be forwarded to the secretary of the corporation. It would add to the ease of the work of the Committee on Credentials if references in the way of vouchers or recommendations from one or more well-known surgeons accompany each application for fellowship.

Surgeons invested with fellowship in the College were required to sign the following pledge:

In particular I pledge myself to pursue the practice of surgery with thorough self-restraint and to place the welfare of my patients above all else; to advance constantly in knowledge by the study of surgical literature, the instruction of eminent teachers, interchange of opinion among associates, and attendance on the important societies and clinics; to regard scrupulously the interests of my professional brothers, and seek their counsel when in doubt of my own judgment; to render willing help to my colleagues and to give freely my services to the needy.

Moreover, I pledge myself, so far as I am able, to avoid the sins of selfishness; to shun unwarranted publicity, dishonest money-seeking, and commercialism as disgraceful to our profession; to refuse utterly all secret money trades with consultants and practitioners; to teach the patient his financial duty to the physician and to urge the practitioner to obtain his reward from the patient openly; to make my fees commensurate with the service rendered and with the patient's rights; and to avoid discrediting my associates by taking unwarranted compensation.

The *California State Journal of Medicine*, in its issue of August, 1913, has this to say about the College:

The *Journal* has been asked by a number of our readers to give some serious information in regard to the proposed "College of Surgeons" and the method of its forming. It grew out of the Clinical Congress of Surgery held in New York last year. These clinical congresses were started by Dr. Martin, editor of *Surgery, Gynecology and Obstetrics*, and a large number of doctors attended them, as clinics are always attractive, and some of the most prominent surgeons in the country participated. The idea of forming a "college of surgeons" was sprung at the New York congress and met with the approval of the mob of those in attendance. It is said that a corporation was then formed, of which Murphy and Martin were two of the five directors, and the proposed name was thus legalized. The scheme was talked over all over the country, quite naturally, and a meeting was called to take place in Washington in May. It was generally supposed that this meeting was for the purpose of discussing the scheme and

determining whether or not it was good and practicable, but the discussion part of it was quite an unnecessary idea; it had all been carefully arranged beforehand. Dr. Ed. Martin took the chair, at the Washington meeting, and Dr. Franklin Martin was made secretary. Dr. Montgomery had been given a type-written set of resolutions by Dr. Ed. Martin, and these were promptly introduced. They called for the adoption of an order of business, reading of the proposed by-laws by the secretary and their adoption (or consideration) section by section, nominating committee, elections, etc. In spite of this resolution the Chair declared the by-laws adopted as read in whole; they were not read section by section, and no one had a chance to discuss them at all. A motion was made to have the Chair appoint a nominating committee of three; an amendment was made to this to have the nominations for the nominating committee made from the floor. This amendment was seconded, but the Chair declared it "inexpedient," and then, without even putting the motion, announced that the motion to appoint a nominating committee of three was carried! This method of procedure certainly has the merit of saving time and words! Thus the "Great College" was born! Now the question arises, what good will it do? Every one licensed to practise medicine is or may be a surgeon; he has as much right to do surgery as the biggest, and a good many of him is doing it and is going to continue. The only people who seem to be threatened with an examination are those who may come along hereafter,—and they do not need it so much as some of the founders! It is a personal and proprietary eruption into the domain of medical education, and comes just at a time when proprietary medical schools are decreasing. Is it not another evidence of this unrest, together with the widespread desire to belong to something; to be "in" something that the other fellow is "out" of? It has yet to be shown wherein the College can do or proposes to do or has planned to do the slightest good except for permitting the use of some letters after one's name! And perhaps offering theoretical encouragement for one to study a little more and be more of a surgeon; but a real surgeon is doing that anyhow!

SOCIOLOGY

During the year many hospitals have established social service departments, usually under the tutelage of sociologic experts sent out from the metropolitan centre. Physicians have shown these specialists much respect and given ready credence to their teachings. We are so prone to announce our own conclusions in a tentative way, with many *ifs* and *buts*, that we find it pleasant to listen to experts, who are quite sure of everything they assert and have outgrown philosophic doubt.

If we inquire regarding the education of sociologic specialists, we will be constrained to add to their dogmatic assertions several grains of salt. Many of them have reached their present authoritative position by a royal road very smooth and very short, while we were trudging along the rough pathway. It was not quite fair to call sociology the

" science of sewage and divorce " ; but it is quite true that in sociologic conferences and conventions there is uttered more high-sounding nonsense than in gatherings of any other sort. The boundaries of the science, such as it is, are not clearly defined, and its exponents make many excursions into the domains of economics, civics, and, of course, medicine. Through these territories they range fancy free, dis coursing upon themes many and strange, happily emancipated from the shackles of logic, rhetoric, and even grammar—old-fashioned things, which the sociologic expert evidently considers obsolete.

One of these sages hailing from New Jersey proposes a remedy for the high cost of food. Let public money be appropriated to purchase tens of thousands of clay flower-pots filled with a rich soil ; let these be distributed through the public schools to the children of all poor families ; let them be set in the back yard, or, if that be lacking, upon the roof, and used for the cultivation of tomato plants. In a single season these plants will yield a great crop of tomatoes, which the poor families can eat, in lieu of mutton, beef, butter, and eggs ; thus substituting for expensive sorts of food an aliment which will cost nothing but the slight labor of cultivation, and that will be joyously performed by the children aforesaid. The author has plenty of statistics showing the nutrient value of tomatoes, both colorifacient and histogenetic. What a wonderful boon for the masses of our crowded cities ! The high-charging farmer will be rebuked, the Beef Trust will be confounded, and the proletariat will reach a lofty plane of prosperity not, like Jack, by climbing up a bean stalk, but by sealing a tomato vine.

Another sociologist lays the blame for the modern ravages of tuberculosis upon the shoulders of Napoleon Bonaparte, though he admits that the Corsican was not consciously, with malice prepense, the author of the White Plague. The sequence of events is quite convincing. When Bonaparte invaded Egypt he took with him Champollion and other French *savants*. Fired with archæological ardor, these men opened up the tombs of the Pharaohs and brought into the light of day many mummies and many hieroglyphic inscriptions. In so doing they stirred up the fine dust, which for centuries had been undisturbed, and in this impalpable dust there were countless tubercle bacilli. For thousands of years these germs had been inactive, dormant ; but now, inspired with active and apparently malignant vitality, they emerged from the royal tombs and spread in every direction, wreaking upon the

modern world a terrible revenge for the sacrilegious acts of the robbers of graves. A sociologic expert, in all seriousness, propounded this amazing theory before an audience of people who were respectable and presumably intelligent.

A UNIQUE MEDICAL CHARITY

The Aid Association of the Philadelphia County Medical Society (*Thirty-fifth Annual Report*, Philadelphia, 1913) is an organization whose methods and results are so radically different from the types of charity now in fashion as to astonish the unfamiliar reader and to incite wonder that anything so antagonistic to the prevalent mode of thought could have survived, in an American city, for a generation, and not only survived but steadily increased its resources.

One striking peculiarity is that each of the beneficiaries during the year received help—real help; not the trivial dole of the charity expert, but a gift of \$50 or more, and yet the treasury was not emptied, but part of the interest from invested funds was added to the permanent endowment. This is most surprising. This tale is like the chirp of some cheery bird of the forest contrasted with the diapason of the great charity orchestra, made up of a hundred societies, and sounding forth with the full power of brass, strings, wood-wind, and battery the grand *motif*:

No funds: more need than ere before!

Give cash, give cash forevermore!

Who are the beneficiaries? The report says that the Committee on Benevolence awards the gifts and takes receipts. These are kept until the accounts are audited at the end of the year and then they are burned. There remains no record whatever to identify the recipients of the money. Years ago a physician's widow and children received in several portions more than \$3000. Her name may be remembered by the survivors of the committee that made the award, but otherwise it is totally unknown and will so remain. This statement makes the reader rub his eyes, to know if he is awake. Can such simplicity exist in a city where there is a united charities building filled with experts examining the poor and recording them in elaborate biographies, indexed, annotated and cross-indexed, records so accurate that, after a score of years, a man may be confronted with documentary proof of the damning accusation that he once asked for half a ton of coal? This doctors' association seems utterly unappreciative of the great

mechanism of the social service experts who have interposed to intercept (by absorption) the pauperizing stream of contributed money.

Its strangest feature is its amazing altruism. The constitution declares that its object is to "afford aid to its members and their families and, in extraordinary cases, to other needy physicians or their families." During the year only one member applied for aid, and it was promptly granted. The widow of a deceased member also received a liberal gift; but more than three-fourths of the money awarded went to physicians or to the families of physicians who had never been members of the association and who had no claim to its benefactions. Altruism is ridiculed by many of the social experts. One general secretary publicly boasted that she "very rarely committed an unselfish act." Doubtless in this instance she spoke the exact truth.

This doctors' aid association is a very unusual organization, and it is to be hoped it will not change its methods or its management. We need some variety in our benevolences: they should not all conform to a single type. The association has an endowment of \$40,000, and its officers are men enjoying the esteem and confidence of the profession. It must be admitted that it is not "up to date," as it has no salaried experts and no "incidental" expenses. In truth, its spirit and plan of work seem to be the outgrowth of theories and methods taught in Galilee and Judea nearly two thousand years ago.

HOSPITAL ECONOMICS

The Management of Hospitals on a Business Basis.—A project is on foot in Philadelphia to reduce the cost of maintenance of all the hospitals within the city, 55 in number, by placing them under business management. Representatives of 30 hospitals and a special committee of Philadelphia County Medical Society held a meeting in the office of Dr. Neff, Director of the Bureau of Health, and discussed the situation. It is believed that great waste prevails in all of the hospitals, and that at least \$200,000 annually could be saved by its prevention, this sum being 5 per cent. of the \$4,000,000 estimated to be the present cost of maintenance. The plan was approved, and the employment of an efficiency engineer to report on the situation was discussed.

OFFICE CASE RECORDS

According to Victor C. Pedersen, of New York (*Amer. Jour. Surg.*, August, 1913), accuracy and brevity may be secured by the

use of charts in which the universally comprehensible algebraic signs are variously modified and adapted to the purpose, the method being founded on the principle of plotting the curve of efficiency,—for instance, in engineering work. By the scheme proposed not only may the temperature, pulse, and respiration be charted, but by signs and symbols the variations in the disease and changes in treatment may be recorded on single lines devoted to these details.

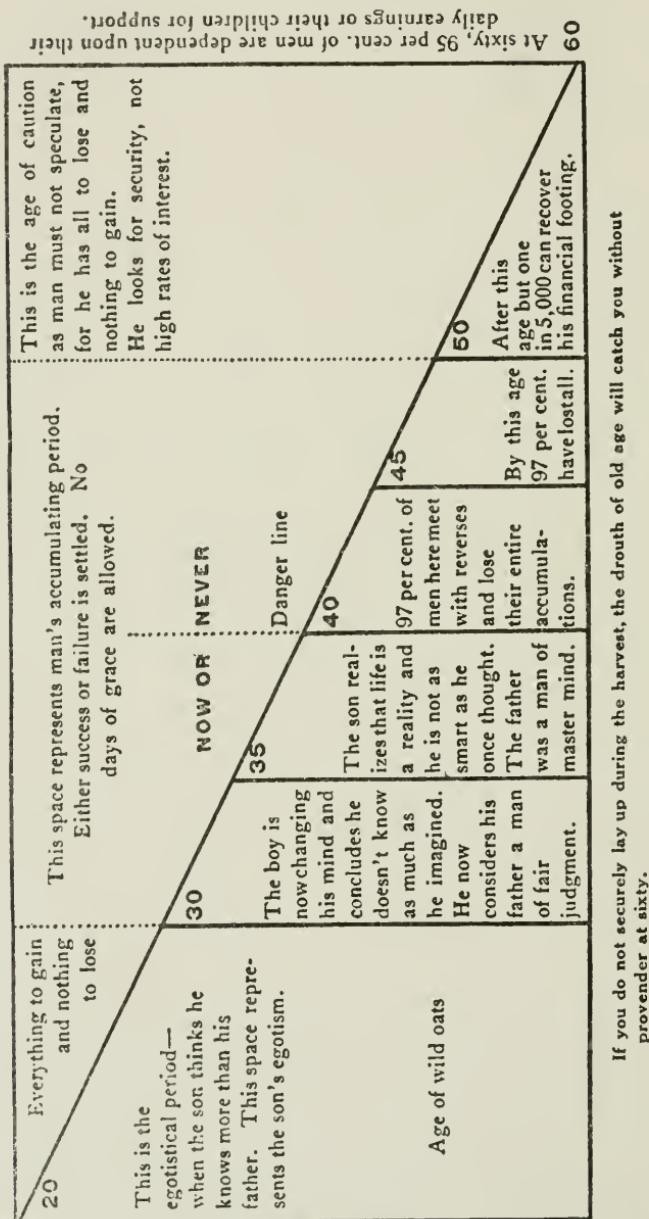
THE U. S. INCOME TAX

There are a number of features in the income tax that will prove irksome to physicians, but none more so than the provision contained in Section 13 of the instructions given on Form 1040. This paragraph reads: "Persons receiving fees or emoluments for professional or other services, as in the case of physicians or lawyers, should include all actual receipts for services rendered in the year for which return is made, together with all unpaid accounts, charges for services, or contingent income due for that year, if good and collectible." According to the newspapers, the word "collectible" applies to any account that has not been charged off on the books of the physician or which, after suit has been instituted, has been found by due process of law to be incapable of recovery. In making the return it would seem as if the easiest course to pursue would be to charge up as income all the accounts not collected by, say, the middle of February, and then next year to charge up against his income as under Section 5 of the general deductions, which reads: "Debts which have been actually ascertained to be worthless and which have been charged off during the year." It is hoped that the doctor may learn a lesson to do his work on a cash basis as much as possible and to send out his bills more frequently, especially on the first of December.

THE SEVEN PRACTICAL AGES OF MAN

Henry J. Fischer, of Cleveland, has tabulated the seven practical ages of man as from 20 to 60 years, and demonstrates that the habit of saving must be formed early in life. From 20 to 30 is the egotistical period, when the son knows more than his father,—the age of wild oats. The years from 30 to 50 represent man's accumulating period, in which success or failure is settled, 97 per cent. having at 45 lost all. From 50 to 60 is the age of caution, when a man has all

to lose and nothing to gain. At 60, 95 per cent. of men are dependent upon their daily earnings or their children for support. The table follows:



PERIODIC EXAMINATION OF INSURED LIVES

Its Economic Influence on the Medical Profession.—This subject was ably discussed by Eugene Lyman Fisk, Medical Director of the Postal Life Insurance Company, in an address before the American Association of Life Insurance Examiners at Minneapolis, in June, 1913. It is a plea for preventive medicine and a concentration of public patronage where it rationally belongs. In spite of the commercialism of the age, the profession, as a whole, is laboring, might and main, to reduce the morbidity from which it draws its revenues. He believes that with the public brought regularly and automatically into contact with scientific medicine, there would be mutual gain. With only about 150,000 physicians in the United States and Canada, and in this district between 3,000,000 and 4,000,000 people constantly ill, besides millions more on the border-line of illness, the supply of trained and competent physicians would scarcely exceed the demand if these people turned to the physician at the beginning of illness instead of consulting almanacs, soothsayers, or other agency of relief, finally to appear before the doctor, demanding that they be instantly restored to health.

THE NATURE OF DISEASE

W. T. Councilman, of Boston, in the *California State Journal of Medicine*, vol. xi, p. 260, discusses the nature of disease, both in the individual concept, and a concept which will apply to the species. He defines disease as a change produced in living things in consequence of which they are no longer in harmony with their environment. A simple conception of health and disease can be arrived at by studying the conditions in a unicellular animal, as the amœba, under a microscope. In no way is the individuality of living matter more strongly expressed than in resistance to disease; no other living organism being so resistant to changes in environment as is man, and to this resistance he owes his supremacy. Our modern civilization depends upon our knowledge of infectious diseases, and the direct application of this knowledge promotes the health, efficiency, and happiness of man. In former times isolation was the safeguard of the people, wars and pilgrimages contributing to disease, and epidemics leading to the defeat of armies and the fall of cities and nations. The in-

fectious diseases of the past would have made impossible the modern extension of the factory and the increased development of city life.

In rapid steam communication diseases tend to lose endemic characteristics, but these are more widely distributed, and there is a greater dissemination of "insect carriers" as well as the diseases of plants.

Step by step he leads up to the change in the medical point of view, as shown by the gradual elimination of medical sects,—the rise of Christian Science being a marked reactionary movement. Formerly medicine was a personal service rendered and paid for; now the dominant idea is wider service to the city, the State, the nation, to humanity, rather than to the individual. The record of recent achievement is a proud one, and the greatest demonstration of prevention of disease is shown by the building of the Panama Canal.

HUMAN AURAS

Dr. Walter J. Kilner, electrician to St. Thomas's Hospital, London, and a well-known student of science, has given us ("The Human Atmosphere, or the Aura made Visible by the Aid of Chemical Screens," New York, quoted *Current Literature*, p. 390) interesting information concerning the aura or haze intimately connected with and surrounding our bodies, whether asleep or awake, and which can be seen when conditions are favorable. This has been, heretofore, perceptible only to so-called clairvoyants, and Dr. Kilner makes no claim to clairvoyancy, nor is he an occultist, his researches being entirely physical and open to test by any interested persons.

LANE MEDICAL LECTURES

The Fourteenth Course of these lectures was delivered in Lane Hall, Medical Department, Leland Stanford, Jr., University, San Francisco, September 3rd to 9th, by Sir Edward A. Schäfer, Professor of Physiology in the University of Edinburgh. The subjects embraced were internal secretion in general, the thyro-parathyroid glands, the adrenal glandular apparatus, the pituitary body, and the influence of internal on other secretions.

These lectures were founded in 1896 by the late Dr. Levi Cooper Lane. They consist of a free course of lectures on medical subjects by men distinguished at home or abroad for their work in either

medicine or surgery, and are open to the medical profession at large and to all students of medicine.

OZONE-MAKING MACHINES

Machines for the production of ozone, supposedly to improve faulty ventilation, have recently been advertised, and some already put in use. To determine the value of these machines, Jordan and Carlson in Chicago, and Sawyer, Beckwith, and Skolfield in Berkeley, Cal. (*Jour. Amer. Med. Assoc.*), made some elaborate experiments which seem to have proved, first, that the bactericidal power of the ozone furnished is small; second, that it is irritating to the respiratory tract; and, finally, that, while it seems to overcome certain odors, it is not improbable that this is accomplished by rendering the olfactory nerve-endings insensitive to them. Further experimentation to determine as far as possible the effect likely to be produced on human beings who inhale the air artificially charged by this apparatus appeared to show that it was irritating, and in no way beneficial.

SWITZERLAND AS A WAR HOSPITAL

The land of William Tell, the cradle of the Red Cross Society, according to the *Tagblatt* (Berne) and the *Journal de Genéve* (see *Literary Digest*, December 6, 1913), asks to be accorded neutrality and inviolability in case her neighbors go to war. In return for this protection and immunity the little republic offers her services as the common ambulance hospital of Europe, and proposes to take care of the wounded of both parties to a war, and return them to their own country on recovery, the charge for such care to be at a fixed rate. This would banish all fears of a cutting off of supplies from Switzerland, would be in accord with the best traditions of the country, and would meet with the eager coöperation of the whole people.

THE PANAMA PARADOX

Any sketch of medical progress is bound to mention the extraordinary healthfulness of the Canal Zone, a condition established soon after the United States occupied that territory and maintained ever since, year after year, proving that it is not the result of accident or good fortune, but the logical outcome of sanitation and therapeutics. Several nationalities are represented in the population: the number of

our own citizens is between ten and eleven thousand, and among them the annual mortality has been less than five per thousand, the lowest death-rate recorded for a community made up of men, women, and children (*J. A. M. A.*, April 5, 1913, p. 1082). A German critic, anxious to belittle any American achievement, declares that comparisons with normal populations are misleading, because the residents of the Zone were "a carefully-selected body of young men in vigorous health, the flower of the States which sent them." This statement itself is very misleading. It is true that the appointees of the government were physically sound and in the prime of life; but there were women as well as men, and many were accompanied by their families, including a number of children and some aged relatives. During the years since the occupancy, there have been many marriages and as large a number of births, as in other communities of similar size, while the average age of the government employees has, of course, risen very much: a fourth of them are now older than Lincoln was when he gained his popular nickname, "Honest Old Abe."

With a fair consideration of the advantages, physical and moral, of this American community, we should expect its death-rate to be lower than the two per cent. recorded in many places; but that it should be less than one-half of one per cent. is surprising. Then comes the astonishing fact that this favored locality includes part of the valley of the Chagres River, which twenty years ago was the most deadly region in the world. The destruction of the swamps, the killing of the mosquitoes, the splendid system of drainage, the sanitary construction of houses—all these great enterprises, which wrought the wonderful change, together with the subsequent wise administration and the admirable facilities provided for the treatment and cure of the sick and injured, constitute an achievement which is without a parallel.

The result was attained by a coalescence of forces such as are rarely seen in harmonious coöperation. First stands Dr. W. C. Gorgas, just appointed Surgeon General of the U. S. Army, whose genius originated the plan and then put in execution. He displayed a combination of creative and executive power hardly ever seen together. He had the hearty support of a President who gave him a free hand, and was sustained by the financial power of the United States Treasury. Added to this was the loyalty and efficiency of that great company of

subordinates, who developed an *esprit de corps* such as was never before witnessed in a work of this kind and has been comparable to the patriotic devotion sometimes seen in war. The whole enterprise is a wondrous example of what is possible when there is a combination of wisdom, science, wealth, and enthusiasm.

VITAL STATISTICS IN THE UNITED STATES

Cressy L. Wilbur, Chief Statistician, Bureau of the Census (*Market World and Chronicle*, October 26, 1912), deals with the strange and shameful fact that the United States is far behind the other leading countries of the world in the registration of deaths, and even more so in the registration of births.

In 1911 our "registration area" included, *for deaths alone*, only 22 out of our 48 States, with the addition of one State having partial registration,—that is, in municipalities with a population of 1000 or more,—of the District of Columbia, and of 38 cities in non-registration States. As for births, until within the past year or two no State, nor city of any size in the country, has had practically complete registration.

The registration of births and deaths in the United States depends chiefly upon the passage and *thorough enforcement* of adequate laws by the States. Under the Constitution, the Federal Government has no authority to conduct such work except in the District of Columbia and upon Federal reservations. But this matter of paying less attention to the births of children than to those of the beasts of the field has been taken up, in what was really a council of war, by the American Public Health Association, in the enactment of a State law in Virginia in 1912, and by Congress in a joint resolution requesting State authorities to coöperate with the Census Office in securing a uniform system of birth and death registration.

It is expected that the new Children's Bureau, which makes a study of infant mortality, will aid in the building up of a public sentiment that will demand the adequate enforcement of our registration laws.

DRUGS

Cocaine.—The anti-cocaine law of May 10, 1913 (*Medical Times*, July, 1913), regulates the possession and use of "alkaloid cocaine or its salts, alpha or beta cocaine or their salts, and any admix-

ture, compound, solution, or product of which cocaine or eucaine or their salts may be an ingredient."

A doctor may not give a prescription wherein cocaine shall exceed one per cent. of the total contents, or have in his possession more than one and one-eighth of an ounce, five ounces at one time being the allowance for hospitals.

All importers of cocaine are required by law (Treasury Decision No. 33456, May 29, 1913) to file an affidavit as to direct imports, and must secure from all persons to whom they sell imports a similar statement as to the use of the coca derivatives.

This declaration is to prevent the indiscriminate use of cocaine, coca, and derivatives and preparations containing them, on the ground that they are dangerous to health. At the same time the declaration permits the legitimate use of these drug products in medicine.

The Use of Heroin by Drug Habitues.—According to the United States Department of Agriculture, December 1, 1913, there has been a sudden increase in the use by persons of a drug habit of the little-known but very dangerous drug called "heroin," particularly in those States wherein rigid laws restrict the sale of morphine and cocaine. By many heroin is held to be more dangerous than morphine, for the reason that it sometimes kills the victim outright and the habit of using it is most difficult to overcome. During the year there were five sudden deaths from it in Philadelphia County, Pa., the victim in each case being a heroin *habitué* who had taken an overdose. Yet it has a wide sale, one druggist in Pennsylvania buying heroin tablets in 25,000 lots.

The Department warns all persons that "heroin" on any label is a danger signal, and that the drug should be taken only on the prescription of a reputable physician.

FOOD ADULTERATION

The Star Extract Works, New York City (*U. S. Dept. of Agriculture*, September 16, 1913), was recently fined \$100 for shipping macaroni color adulterated with arsenic from New York into Missouri. It was found that the arsenic was not applied externally to prepare the product for shipment, but was added as a poisonous and deleterious ingredient which might be injurious to health.

THE PREVENTION OF BLINDNESS

On June 5, 1913, the Governor of Pennsylvania approved Act No. 295 of the General Assembly for the prevention of blindness. This act requires that physicians, midwives, and other persons having the care of an infant whose eyes have become inflamed, swollen, or reddened at any time within two weeks after birth shall report the same in writing, together with the results of treatment of each case, and fixes a penalty for violation of this act. The wording of this act would seem to imply that the midwife has not only the right to bring the child into the world, but also to treat it for any diseases with which it may be afflicted.

GOVERNMENT MEAT INSPECTION

The magnitude of this service is shown by the fact that in the past seven years (*U. S. Dept. of Agriculture*, September 22, 1913) 377,000,000 animals were inspected at slaughter, of which number 1,100,000 carcasses and 4,750,000 parts of carcasses were condemned. Federal inspection is maintained at 792 slaughter and packing houses in 227 cities and towns throughout the United States to guard against the dissemination of tuberculosis and other diseases which man contracts from the eating of affected meat. The number of inspectors and assistants is 2400. These highly-trained veterinarians develop a quickness and certainty in detecting tuberculosis and other diseases in animals which is very interesting. Every carcass passes under the scrutiny of several inspectors, each of whom has as his special duty the examination of particular parts, and in these the slightest abnormality is instantly detected. Such carcasses are set aside for further inspection by a final inspector.

THE MILK SUPPLY

Faults in Systems of Milk Inspection.—Mr. Ernest Kelly, in charge of market milk investigations (*U. S. Dept. of Agriculture*), claims that there is great lack of uniformity in the milk requirements of different States, one State requiring pasteurization, while another does not, one allowing a bacteria count of 500,000, while another limits it to 100,000. Twenty-two cities

spend nothing for milk inspection; one city spent last year one-tenth of a cent per capita, while a little town in Georgia spent 19 cents per capita on this work. Milk inspectors are poorly paid, the position attracting only "political ward heelers, hungry for any crumb from the loaf of the Commonwealth." Mr. Kelly claims that bacterial count is not a complete safeguard, that the sediment test is valuable as a means of demonstrating carelessness in milk production, but that simple, uniform, and enforceable laws are needed, city inspection regulated, and the sale of "bulk" or "loose" milk restrained.

Medical Milk Commissions and Certified Milk.—The first milk commission (*U. S. Dept. of Agriculture*, September, 1913) was organized in 1893, since which time 60 have been established, although one-third of these are now inactive. The word "certified" has been registered in the United States Patent Office, and may be used only by a duly organized medical milk commission. About 125 dairies are producing certified milk at the rate of nearly 25,000 gallons daily, an increase of 300 per cent. in five years. Yet at the present time only one-half of one per cent. of the total milk supply of the country is certified. The most absolute requisite for certification is not expensive equipment so much as unremitting attention to details.

Pasteurization of Milk at Low Temperatures.—The United States Department of Agriculture has been conducting experiments (*Bulletin 166, Bureau of Animal Industry*) in treating milk at different temperatures and for different periods of time, and finds that when milk is pasteurized at 145° F. for 30 minutes only the chemical changes are so slight that they are not likely to render the protein or phosphates of lime and magnesia less digestible than in raw milk. At low temperatures the bacteria which survive (*Bulletins 126 and 161*) are the lactic acid organisms concerned in normal souring of milk. The method has the merit of economy, since it takes 23½ per cent. less heat to raise milk to 145° F. than to 165° F., and also calls for less ice in shipping. The Department therefore recommends the process for market milk.

A PRESCRIPTION FRAUD

The United States Department of Agriculture, November 19, 1913, gave warning of a new trick which, it is believed, is deceiving

many people who buy patent medicines under the impression that they are getting the prescription of a regular physician free of charge. The mode of procedure is as follows:

A catchpenny advertisement gives the name and address of some person who was ostensibly clutched from the jaws of death by the use of a wonderful prescription which is offered freely to all suffering from similar ills who may ask for it, the name of the skilful physician who gave the prescription being withheld for ethical reasons. The recipe, when secured and taken to a druggist, is found to call in large part for some patent preparation which the druggist has not in stock and must secure. For this service the customer pays a good, stiff price, and he gets in effect merely a patent medicine which, save for the druggist's label and the prescription number, is the same as if sold in the maker's own bottle.

This scheme is so planned as to evade Government laws, and the people cannot be reached by either the Food and Drugs Act or the Postal Laws. The Department therefore cautions the public to be suspicious of people who use advertising space, or send out circulars, seemingly from a love of humanity alone.

ADVANCES IN CHEMISTRY

If hydrogen gas be introduced in minute quantities into an X-ray tube, and the kathode rays be excited, helium and neon are formed. The physicists are now debating whether this is a transmutation of the elements, or has energy been forced into material shape?

An allotropic form of nitrogen has been discovered, giving off an intense yellow light as the atoms again combine among themselves to form the ordinary inert nitrogen of the air. A method of making nitrogenous compounds to be used as fertilizers may thus be near discovery.

Hermann Hille (*Medical Times*, Feb., 1914) sums up the differences between colloids and crystalloids as follows:

- (1) The structure of colloids is cellular, plastic. The structure of crystalloids is crystalline, rigid.
- (2) Colloids diffuse slowly. Crystalloids diffuse rapidly.
- (3) Colloids are singularly inert in all the ordinary chemical relations. Crystalloids are very active chemically.
- (4) Colloids possess great mutability. Crystalloids possess great stability.
- (5) Colloids act gradually. Crystalloids act almost instantaneously.
- (6) Change of temperature in the act of solution is barely per-

ceptible in the case of colloids. It is very marked in the case of crystalloids. (7) Colloids are held in solution by a most feeble force. Crystalloids are held in solution by a strong force. (8) Solutions of colloids are always sensibly gummy or viscous when concentrated. Solutions of crystalloids are not gummy or viscous, no matter how concentrated. (9) Soluble colloids are singularly insipid. Soluble crystalloids are singularly sapid. (10) The osmotic pressure of colloids in solution is low. The osmotic pressure of crystalloids in solution is high. (11) Colloids lower the freezing point of their solvent little. Crystalloids lower the freezing points of their solvent much. (12) Colloids raise the boiling point of their solvent little. Crystalloids raise the boiling point of their solvent much. (13) Solutions of colloids coagulate. Solutions of crystalloids crystallize. (14) Solutions of colloids are poor conductors of electricity. Solutions of crystalloids are good conductors of electricity. (15) Colloids are separated from their solvents by the process of filtration and ultra filtration. Crystalloids are not separated from their solvents by the process of filtration. (16) Colloids can be readily separated from their solvent by centrifugal force. Crystalloids require great centrifugal force to separate them from their solvent. (17) Colloid solutions foam when agitated. Crystalloid solutions do not foam when agitated. (18) Colloids scatter and polarize a beam of light. Crystalloids do not scatter and polarize light. (19) Colloids are optically heterogeneous, as seen in the Tyndall phenomenon and under the ultra-microscope. Crystalloids are optically homogeneous or empty. They do not produce the Tyndall effect, nor are they visible under the ultra-microscope. (20) The molecular weight of colloids is high. The molecular weight of crystalloids is low. (21) The molecules of colloids are complicated. The molecules of crystalloids are simple. (22) Colloids are porous, therefore have a large surface development and correspondingly large surface energy (power of absorption). Crystalloids are solid, and therefore have a small surface and little surface energy. (23) Colloids possess a strong adhesive power. Crystalloids possess little power of adhesion. (24) Colloids constitute the vast organic world of matter, which comprises the vegetable, animal and human kingdoms, as well as the colloidal portion of the mineral kingdom. The inorganic crystalline portion of the mineral kingdom is composed of crystalloids. (25) The toxicity of colloids is small. The poisonous action of crystalloids is great. (26) The food of the animal and the human is the colloid. The food of the vegetable is the crystalloid. (27) The natural medicine of the animal and human organism is the colloid. The natural medicine of the vegetable organism is the crystalloid.

These distinctions between colloids and crystalloids are not absolute but only relative. They characterize the extremes of the two forms, conditions, or states of matter, and become less and less pronounced as we approach from either side the line of cleavage or of demarcation, the existence of which is still disputed, and may not be demonstrated very soon. Whether we accept the existence of a distinct line of cleavage between the colloid and crystalloid, or the organic world and the inorganic world, we are compelled to admit that the phenomena of what we call vegetable and animal life are inseparably connected with, and dependent upon, the colloidal form of matter, and that matter in crystal-form does not and cannot serve as a medium for the expressions and manifestations of life.

ELECTRICITY

During the past year much attention has been paid in the CLINICS to electrotherapeutics and radiology. The great importance of the subjects demands the serious consideration of all facts which may increase our present knowledge of the therapeutic value of those agents; but the newspaper comments engineered by certain well-known members of the medical profession on an insufficient number of cases treated by radium are to be deplored. The raising of false hopes in one suffering from cancer is criminal, the more especially if it be done by the charlatan for his own gain, knowing well that his statements have not been as yet given the test of time.

In an interview with a correspondent of *The Medical Times* early in January, 1914, Dr. Howard A. Kelly, of Baltimore, said:

Our idea is to obtain the utmost general publicity on the premonitory signs of cancer. We particularly seek to inform women of the early symptoms of those particular forms of which they are the victims. We did this because our statistics (especially those prepared by our surgical pathologist, Bloodgood) show that, if discovered in the early days, an enormous percentage of permanent recoveries can be secured by operation.

In fact, medical science has taught for years, and still teaches, that there is but one way to treat cancer, in its advanced stages, and that is by the knife. This treatment, as a matter of practice, still holds perfectly good. Radium is a precious handmaid to surgery; it does not supersede it. Even if radium would cure all cases readily—and this remains to be demonstrated—we could not yet realize the new remedy on the large scale, owing to the extreme scarcity of the element.

This situation is aggravated by the fact that Dr. Burnam and I believe that it is only radium in comparatively large quantities that accomplishes the most satisfactory results. Radium gives off rays of three kinds, named alpha, beta, and gamma. Domenci and Wickham taught us that it is the gamma rays of radium which have a remarkably disintegrating effect upon tumor tissue.

These rays affect all kinds of tissue, both that which is normal and that which is diseased. In large quantities the gamma rays make healthy skin turn red and blister. Those who handle it usually bear evidences of the fact in sore fingers. Under careful use there is no such thing as a radium burn in any way comparable to an X-ray burn, of which there is such a universal dread.

These rays, however, affect non-cancerous and cancerous tissue very differently. In small quantities the gamma rays of radium penetrate good, healthy, normal tissue without producing any noticeable effect. The same rays, however, and in the same amounts, do exercise a beneficial effect upon diseased tissue, such as that affected by cancer. Brought to bear upon a particular area, part of which consists of normal cells and a part of tumor cells, the effect is soon apparent. The normal cells remain practically unchanged. The tumor cells

show fundamental alterations. They swell, lose their characteristic appearance, break down, and are absorbed. Sometimes they seem to melt back in to the normal tissue.

Now, the radium treatment accomplishes about the same thing as the surgeon's knife. The knife gets rid of the cancerous tissue by cutting it out *en masse*; the radium gets rid of it by destroying it cell by cell. In other words, at the present stage of development, radium acts most successfully on the kind of tumors that surgery most easily destroys. These are superficial tumors—of the skin, face, jaw, tongue, and the like. They are the tumors which are on the outside of the body, which we can see and handle. In many such cases, radium, according to our experience, seems to be an actual cure. We have had success extending over many months in a considerable number of cases.

At first it might seem, since surgery is already quite effective in cancers of this kind, that we have gained nothing. But it is an immense gain. The surgical removal of tumors of the face, for example, involves disfigurement. If one has a cancer on the nose, the only thing to do is to cut off the nose; other affections also involve the removal of an eye, the jaw, the tongue, a lip or the chin. When radium destroys such tumors—as it does in many cases—the face is restored virtually to its normal condition. When the growth has widely infiltrated surrounding structures, the surgeon is often helpless. After removing the primary growth, however, he can irradiate these tissues and so have a greater chance of removing any stray cells that may be left. Radium, I believe, can thus be used to make doubly sure all ordinary operations for cancer. Another important point in considering the usefulness of radium in superficial tumors is that it does not involve the suffering of a surgical operation, being practically painless.

Perhaps radium's greatest triumph is in treating a particularly distressing and difficult form of cancer—that of the uterus. This and cancer of the breast are the commoner forms in which cancer chiefly attacks women, just as men suffer more from cancer of the stomach. Early operation with the knife cures this in a good many cases, but the operation is a radical one, and is not free from danger. Radium is extremely valuable in cases of this kind.

There are other skin affections, not cancerous in their nature, in which radium is a blessing. These are the vascular tumors, birth marks, "port-wine" stains. Dr. L. Wickham, of the St. Louis Hospital, Paris, has had many remarkable successes, having treated more than a thousand cases in the last seven years. It looks as though, for disfigurements of this kind where surgery is often powerless, radium may be practically a specific. It does not produce inflammation or pain, an important consideration, especially as children are often patients.

Scars, too, are often entirely removed, leaving the face practically normal. The emanation of radium—a gas given off by radium—is used dissolved in water or alcohol, for internal administration, and is being tested out in cases of gout, rheumatism, arteriosclerosis, and the neuralgias, as well as in certain blood diseases and anemias. Radium does not necessitate the use of an anaesthetic, and its administration causes no pain and almost no discomfort. The radium salt is kept inclosed in a fine platinum tube about an inch long. This tube is again encased with lead, which is used because it acts as a filter, keeping in the alpha and beta rays—which are more destructive to normal tissue—while letting the gamma rays slip through.

The tube, further covered with some soft substance, is then laid in immediate proximity to the diseased part; if necessary, it can be attached by surgical plaster; in some cases incisions into the diseased part may be made. Its action upon the cancerous tissues begins at once; the application lasts from 4 to 6 to 24 hours. Sometimes in a month or six weeks the growth vanishes. The radium so used can be used over and over again.

Most readers are now familiar with the much-heralded "miracle of radium," the mysterious substance that apparently defies all the known laws of the material universe, in that it keeps giving off matter without diminishing its own bulk. Every little particle of radium has been giving off its rays for thousands of years, and will continue to be active for two thousand years longer, when it will have just half its present weight, but will be just as able to throw out its rays as it is now, only in lessened amount, so that the small amount of radium now in use may be inherited by generation after generation of enterprising surgeons.

However, what about the practical question: Supposing radium does cure cancer, how widespread will be its use?

The newspapers have familiarized the public with the fact that there are extremely small amounts in existence. With a grain of radium one can do much, but the sufferers from cancer are fearfully numerous; half as many people in New York State die from this disease as from tuberculosis. Manifestly, even though radium were an absolute cure for all cases, the mortality rates would change very little, as so few people could gain access to it.

Is this treatment, then, to remain a luxury for the few, presumably the rich? We hear much of a "radium trust," of a few people getting all of the precious element into their own hands. The value of all the radium which has been taken from the earth is from \$2,000,000 to \$3,000,000, so that one of our New York or Chicago millionaires might easily buy it all.

The larger amount of this precious substance now in European laboratories and hospitals has come from the United States. The small quantities now held by American scientists they have been obliged to buy back at high prices from Europe. At present there is only one firm engaged in this country in extracting and refining radium, and this firm has not yet entered the radium market.

Austria, France, Germany and England have established radium institutes, the purpose of which is to study the effects of the mineral, and to conserve the supply. A national Radium Institute has been formed in our country, and it is expected that, as a result of its efforts, the United States will show more interest in developing its radium resources.

It is also the purpose of the Institute to acquire radium to test out all its possibilities in relieving disease, especially cancer.

In the new radium science America should take the lead from now on, not only because it has especially competent experimenters, but because it has the one indispensable thing that other nations do not possess—a comparatively large supply of radium in its own mines.

After M. and Mme. Curie made their wonderful discovery, the world eventually awoke to the fact that in that Paris laboratory had been created a new means of treatment that inaugurated a new era in the eradication of cancer, which has claimed its victims in spite of efforts of the world's leaders in medicine and surgery.

The Death-Rate from Cancer.—In speaking of cancer, Dr. Park writes:

“Cancer is the medical sphinx of the ages, which looms up before us as does the great sphinx at Ghizeh, the great, frowning interrogation point of interest to the student, alike of the history of medicine and of the hidden causes of disease. There is no more important subject before the medical profession to-day than this one of cancer. Is it really on the increase, as so frequently stated, or are the profession and the public alarmed?

“During the five years, 1900-1904, inclusive, there occurred in the then smaller Registration Area, with a population of 28,807,269, a total of 106,119 deaths from cancer, giving an average annual death-rate of 66.6 per 100,000 of population.

“From this rate of 66.6 at the end of 1904 it rose as follows: In 1905 it was 72.1; in 1906 it was 70.8; in 1907 it was 73.1; in 1908 it was 74.3; in 1909 it was 73.8; in 1910 it was 76.2. During this last year (1910) the total number of deaths from cancer in the Registration Area was 41,039. Moreover, the death-rate of 76.2, of 1910, was the highest ever recorded up to that time in this country.

“Contrast that figure of 76.2 with the rate of 63, which was the figure in 1900, and of 70, which was the rate for 1904. Or, tabulated, we have these figures: Annual death-rate, per 100,000, for 1900, 63; annual death-rate, per 100,000, for 1904, 70; annual death-rate, per 100,000, for 1910, 76.2. During this period, from 1887 up to 1913, there has been no corresponding increase in population. Here, then, we are confronted by an enormous increase in the prevalence of this disease, explainable in only one way, viz., that the disease is alarmingly on the increase.”

The Source of Radium—Until recently only Europe had treated the ore which is the source of the radium which has been found. The skill and daring of heroic American explorers has lately made known the existence of radium-bearing mineral in deserts and unknown regions of some of our Western States. Here is how those heroes of science describe what they have learned:

“American carnotite is found chiefly in Montrose and San Miguel Counties, Colorado, and in Utah. The richest of all American carnotite localities and, indeed, the richest known radium-bearing region in the world, is that of the Paradox Valley, extending from Hydraulic on the north to the McIntyre district on the south,—all absolute desert.

“Geologists are now in the field making a special study of these carnotite ores with special reference to their occurrence and origin, of which altogether too little is now known. In the Paradox region, the deposits seem to lie invariably just above the fine-grained La Plata sandstone. This rock is usually exposed high on the sides of the canyons. In a few instances the deposits are only a few feet under the surface, the higher formations having been eroded; but for the main part, the stratum in which the carnotite occurs, when not entirely eroded, is deep below the surface of the mass. Accordingly prospecting is mainly carried on along the sides of the canyons, and where vanadium and uranium stains are seen upon the rock the prospectors blast out tunnels to determine the extent of the pockets that are underneath the surface.

“Radium is found with uranium minerals only, and where there is no uranium, radium has never been found. Uranium and therefore radium are held in this country in carnotite and its associated minerals, and in pitchblende. Carnotite is a lemon-yellow mineral, usually found in pockets of sandstone

deposits. The mineral may be in the form of light yellow specks disseminated through the sandstone, or as yellow incrustations in the cracks of the sandstone, or may be more or less massive, associated with blue, black, or brown vanadium ores.

"Pitchblende is a hard, blue-black ore that looks something like magnetite, but is heavier. It is found in pockets and veins in igneous rocks. This mineral is not nearly as widely distributed as carnotite. Occasionally it is associated with an orange mineral called gummite.

"Here is the curious way in which the tiny particles of metal, far more precious than gold or diamonds, are discovered: A photographic plate is wrapped in the dark, in two thicknesses of black paper. On the paper rests a key and then, just above the key, are suspended two or three ounces of the ore, the whole placed in a light-tight box. After three or four days, the plate is developed and if the ore is appreciably radio-active, an image of the key will be found on the plate.

"There is prospect that most of the low-grade ores can be successfully concentrated by mechanical methods, and experiments at the Denver office of the Bureau of Mines indicate that a concentration of four to one can be obtained. In the working up of radium-containing materials the first operation is usually effected by boiling with sodium carbonate solution, filtering and washing free from sulphate. Naturally the greater the excess of sodium carbonate, the larger the proportion of insoluble sulphate converted into carbonate.

"The carbonates, washed free from the sulphates, are treated with pure hydrochloric acid, which dissolves the alkaline-earths, including radium. From the solution, the radium may be extracted by sulphuric acid and reconverted back into carbonates as before, or sometimes more conveniently they may be made into chlorides by saturating the solution with hydrogen chloride. This is a method of great utility in the laboratory, for the most probable impurities, chlorides of lead, iron, calcium, etc., remain in solution and only the barium and radium chloride are precipitated, practically in the pure state. Radium chloride and radium bromide are paid for on the basis of the metallic radium they contain. The price of \$120 per gramme of the metal is equivalent to approximately \$91,000 per gramme of radium chloride, or \$70,000 per gramme of radium bromide.

"There is no question that there is to be an increased radium production, but the uses of and demand for radium are apparently developing at an even greater rate. Although, until recently, the manufacture of radium, from carnotite, has been carried on almost wholly in France and Germany, there appears to be no good reason why our American carnotite should not be treated at home. Carnotite is much more easily treated than pitchblende and the essential features of methods for its chemical treatment are well known, although much of the mechanical detail of operation has been kept secret. There seems to be no good reason why any of our carnotite ores should not be shipped abroad.

"It is highly important that the medical profession should also have some guarantee of the material they purchase, even if it is purchased in small quantities. As several frauds in the sale of radium have already been perpetrated upon American physicians, they should all require that the quality of the material purchased should be certified under conditions which prevent error.

"A coöperative agreement has been entered into with the newly organized National Radium Institute, whereby the Bureau of Mines obtains the opportunity of a scientific and technological study of the mining and concentrating of carnotite

ores and of the most efficient methods of obtaining radium, vanadium, and uranium therefrom, with a view to increased efficiency of production and the prevention of waste.

"The Institute obtained the right to mine 27 claims in the Paradox Valley region, among which are some of the best mines in this richest radium-bearing region of the world. Nearly 100 tons of high-grade carnotite have already been produced. Under the agreement with the Bureau of Mines the technical operations of the mines and mill are to be guided by the scientific staff of the Bureau. Work will begin in an experimental plant to be erected in Colorado.

"The Institute has been formed for the special purpose of procuring enough radium to conduct extensive experiments in radium therapy with special reference to the curing of cancer. It also expects to carry on investigations regarding the physical characteristics and chemical effects of radium rays and hopes in time to be able to assist or perhaps even duplicate the effects of these rays by physical means."

Modified X-Ray Treatment.—Surgeon John F. Anderson, U. S. P. H. S., director of the United States Hygienic Laboratory, advocates modified X-ray treatment as a substitute for radium in the treatment of cancer, according to reliable statements. He says:

"Radium will never cure more than a fraction of the cancer cases, nor relieve more than the most pitiful percentage of sufferers, while the use of the modified X-rays may be applied to every case. There would never be a sufficient supply of radium to meet all demands, but any hospital could equip its machines with the new device, making almost as efficacious a treatment as radium."

A well-known authority remarks:

"Radium will always have its place in every laboratory and hospital that can afford it. But when one considers how expensive it is one can readily imagine how much more universally the modified X-ray will be used. This new ray is not in a strict interpretation of the word new. It is the old ray many times intensified and so perfected that it can be applied with ease, and applied, too, to any part of the body.

"The ray has been developed to the highest point of intensity and perfection, and that must suffice. The time is not far distant when the world will know all about it. There is no doubt about its healing properties, and physicians who have examined the new device regard it as a most important and far-reaching discovery."

Malingering.—One of the advances made in electricity through the use of condenser discharges has been the detection of malingering by determining to a nicety the varying degrees of muscular degeneration, a subject which will be taken up in a subsequent issue of this quarterly. The treatment of uterine fibromata by the X-rays has been shown to be efficacious, especially when hemorrhage is an annoying concomitant.

Death through Electricity.—Those interested in death by lightning and electric currents will find the Goulstonian lecture delivered by Dr. A. J. Jex-Blake of interest.

TERMS NEEDED IN ELECTROTHERAPY

H. L. Jones (*Berliner klinische Wochenschrift*, January 20, 1913) gives a *résumé* of the history of electrotherapy for the past fifty years. At the beginning of the period reviewed, the medical application of electricity was mainly in the hands of men of little education, who travelled about from town to town, delivering lectures and showing the effects of the faradic current by arranging their auditors in a curved line, each person grasping the hands of those next to him, so that all would form a circuit. The tingling sensations and muscular spasms produced when the magneto-electric machine was put in motion did not have the tonic influence asserted by the lecturer; but they certainly furnished a great deal of amusement, and the "grindstone battery," as the machine was popularly named, was famous as a fun-making device.

The profession, of course, looked with disfavor upon men who thus combined therapeutics with the show business, and the disfavor hindered the proper use, even the proper investigation, of the force itself. Sometimes, however, these "medical electricians" shocked the physicians, as well as the patients, by performing remarkable cures. Such cures could not be ignored, and gradually the profession was forced to admit that electricity had medicinal value and deserved the tribute of systematic study. Prejudice was also lessened by the growth of a more tolerant spirit, which began to appreciate the truth that the healing art must utilize everything which proves of value, no matter what label it may once have borne. This change was much promoted by the publication of Ziemssen's great cyclopædia, which became authoritative and which rehabilitated hydrotherapy as a part of regular therapeutics. Water treatment had for a time been exploited by a group of irregulars who were exceedingly hostile to the profession. These have almost entirely disappeared since baths have been adopted among the items of the armamenta.

In the hands of educated men the therapeutic uses of electricity have grown more numerous; but progress has not been very rapid, and there is still much uncertainty as to the boundaries of its utility. The greatest obstacle to further progress is the lack of a proper nomenclature. Every science needs a supply of words, especially nouns and adjectives, to designate the things and to describe the qualities, with

which that science deals. Without such terms communication of thought is difficult and any intelligent discussion well-nigh impossible. The paucity of words expressing ideas in electrotherapeutics is such that, when physicians endeavor to confer upon the subject, they must eke out their meaning by awkward circumlocutions and even revert to the primitive sign language. Accurate transmission of thought by writing is out of the question. What would happen to a physician who would send to a pharmacist the following note?—

DEAR SIR: This will introduce Mrs. Blank, who needs to take drugs. Kindly administer them.

The druggist would doubt the man's sanity, and the patient would change her doctor. Yet a note like the following is very common:

DEAR SIR: This will introduce Mrs. Blank, who needs electrical treatment. Kindly give it to her.

Physicians are placed in this well-nigh absurd position, not because they are ignorant of the patient's needs, but because they have no words to express them. The long-continued labors of pharmacologists have furnished us with terms accurately designating drugs and their qualities, and we can convey our meaning clearly and fully in the narrow compass of a prescription; but for the wide scope of electrotherapeutics we have only the fragmentary beginning of a nomenclature. A great service will be performed by the man who supplies the needed body of terms, and it is to be hoped this task will be performed by some American physician. He must know not only nosology in its widest sense, and electrophysics, but also the languages from which we derive our scientific terms, the principles of etymology, and the laws of word-building.

Perhaps physicians equipped with such philological knowledge are now rare; but, in spite of the ridicule and contempt which have been heaped upon linguistic studies, as pedantic, obsolete, and useless, and which are rearing a generation of doctors who speak like hack-drivers—in spite of all this, there are still among the older members of the profession men of liberal scholarship, well qualified to undertake this work.

It is very important that the large number of new ideas in this field should be expressed by new words, not by modifications of terms already in use—a common but pernicious practice, which always leads

to uncertainty and confusion. Often a man who makes a discovery or an invention tries to adapt to the expression of an entirely novel idea some term long appropriated to the expression of something else and which can never afterward be cleared of its ambiguity, as, for example, the cumbrous and misleading name "sphygmomanometer," so unwisely adopted instead of the expressive and correct term, "haemopiezometer."

In this respect an admirable example has been set by those who created the fundamental terms of electrophysical science. The amazing expansion of this science, which began forty years ago, soon outran all the words in use, and inventors and engineers had great difficulty in making themselves understood; but, fortunately, the leaders who were guiding the movement were men of broad culture. They recognized the pressing need of a nomenclature, and felt that, as the ideas were wholly new, the words to convey those ideas must be formed *de novo*, so that they would signify the new idea and nothing else whatever.

They needed names for electric units of various kinds, and, instead of timidly resorting to a circumlocution,—e.g., "an antitoxin unit,"—they struck out boldly and gave to each unit a distinctive name, deriving the words from the surnames of renowned discoverers and inventors. Thus they gave us "volt" from Alessandro Volta, "farad" from Michael Faraday, "ampère" from Andre Marie Ampère, "kilowatt" from James Watt, and others of like derivation. By a stroke of genius they gave to electrical science a group of admirable terms and, at the same time, immortalized some of its most famous pioneers; for there is no renown so permanent as that embodied in a word which becomes part of the common speech.

DREAMS.

On the Origin of Dreams.—Dreams, in the opinion of Mennella (*Giornale di Medicina Militare*, vol. lx), are pathological as regards their origin and always due to intoxications of varying nature and degree. After reviewing the nature and causes of sleep, he passes on to the discussion of the causes of dreams, which he finds always within us, with toxins as the chief contributors. These toxins may be endogenous or exogenous. Dreams, for our author, are, there-

fore, unconscious reactions of the sensory centres of the cerebral cortex, provoked by toxins. More frequent than any other are those of gastro-intestinal origin; these, in the opinion of the author, are the most permanent causes of irritation of the sensory and motor areas of the cerebral cortex, and dreams vary in intensity, not only in direct proportion to the excitability of the nerve-centres themselves but also in proportion to the quality and quantity of the toxins circulating through the brain in the blood. Dr. Mennella's conclusions are:

(1) In the well the principal origin of these toxins is in the intestinal canal and with which may become associated those formed in fatigued muscles, brain, and the rest of the body.

(2) When the quantity of the toxins is large, both sensory and motor areas become involved, giving rise to irregular, limited, unconscious movements.

(3) In sick persons the toxins produced by the disease are added to the above.

(4) The diseases giving rise to the most anxious and strangest dreams are the fevers, intracranial affections, and gastro-intestinal disturbances.

(5) The intensity of dreams is not determined by the particular disease, but by the quantity and quality of the toxins.

(6) With the same amount of circulating toxins two cases may differ in direct proportion to the excitability of their nerve-centres.

(7) The reactions of the nerve-cells to circulating toxins during sleep are very intense in neuro- and psychopaths, very slight in the phlegmatic.

(8) The circulation through the brain influences the vivacity of dreams, this being more lively in children than in old people affected with arteriosclerosis.

(9) Many of the exogenous poisons give rise to vivacious dreams (alcohol, etc.), others to characteristic ones (opium, phosphorus, hashish, santonin).

(10) The intense emotions experienced during waking hours are reproduced during dreams by the same causes by which dreams are remembered after waking—overexcitability of nerve-centres, increased blood circulation, and increase in autotoxins.

(11) The phenomena of unconscious cerebration during dreams are an effect of a greater impressionability of the psychic centres,

owing to their intoxication by cerebral fatigue poisons during the day.

(12) External stimuli may give direction to the contents of a dream, but the cause of it is always internal and of toxic origin.

(13) The ideas of dreams, as the hallucinations, are of central origin, while those of consciousness are of external origin; the former are centrifugal, the latter centripetal.

(14) The supine position gives rise to anxious and strange dreams only when going to bed on a full stomach—a time when toxic ferments are produced in the stomach.

(15) Digestion during sleep in the erect posture is slowed, but not arrested; it can not be completed in the horizontal position.

(16) Dreams normally come on a few hours after the beginning of sleep. When, however, toxins are abundantly present in the circulating blood, as in cases of fever, they appear soon after meals, in dietetic indiscretions, alcoholic intoxications they come on suddenly.

(17) Changes in the weather render dreams more lively in man and animals through their influence on the intracranial circulation and by their resuscitating old morbid processes, and especially uræmic conditions.

(18) Dreams often reflect the daily life, but they sometimes also reveal the remote past and become strange.

(19) In dreams consciousness is absent; but in emotional dreams consciousness may return at any moment, or whenever from any cause the heart's action is increased and more blood is sent to the brain.

(20) A return to consciousness is either complete or incomplete in accordance with the amount of blood circulating in the brain.

(21) The total or partial appearance of consciousness during dreams impresses the contents of a dream upon the brain, so that they are more or less remembered on waking.—H. G. Beyer, in *U. S. Naval Med. Bulletin*, July, 1913.

INTERNAL SECRETION

Degener (*Quart. Jr. of Exper. Phys.*, 1913) has shown if the thyroid be removed in the rabbit that the hypophysis increases in size.

Those interested in the relation of the ductless glands to the pelvic organs will find Bell's *Arris* and Gale lectures at the Royal College

of Surgeons of interest. He holds that the thyroid, the pituitary, and the adrenals possess an influence over the activity and integrity of the genitalia, while the thymus, and possibly the pineal, prevent sexual precocity.

Backward children are no longer only to have their adenoids removed, but are to be fed on the extract obtained from the pineal glands of young bullocks. Fifty cases of backward children, under the age of nine, were thus treated by Dana and Berkeley (*Medical Record*, May 10, 1913) to the great satisfaction of their teachers.

EFFECT OF EMASCULATION UPON THE DUCTLESS GLANDS

The widespread hope that medicinal extracts representing the potencies of the ductless glands may enable us to control some hitherto intractable diseases, emphasizes our regret that there is so much divergence in the reports of their clinical employment. Some effects, —e.g., the production of ischaemia by adrenalin,—are uncontested, but regarding others the differences are irreconcilable. One trustworthy and competent observer secures repeatedly a certain result; another observer, equally conscientious and intelligent, after repeated trials reports that result as unattainable, although the remedies used by each are presumed to be of identical composition. Such contradictions raise a very serious obstacle to progress in organotherapy. But suppose the presumption of identity is mistaken: suppose the two observers unwittingly used remedies which differed in an important particular; then the contradiction disappears and a satisfactory explanation is furnished for the divergence in the results.

It is such an explanation which is offered by Frank R. Starkey, who lays down the rule that, in making medicinal extracts, the ductless glands of emasculated animals should never be employed (*The Prescriber*, Edinburgh, Scotland, April, 1913). He claims that the internal secretions of the ductless glands, and hence the medicinal extracts, like pituitrin, thyroidin, etc., are greatly altered by castration, and that only intact animals should be used as the source of the therapeutic preparations. That the extracts from these unlike sources have not been chemically differentiated does not disprove this claim; for physiological tests may make discriminations not shown by the microscope or by chemical reagents.

Animals deprived of their sexual powers manifest not only a radical change in disposition, but most important trophic alterations, effected, probably, through the action of the ductless glands, which exert so much influence upon the nutritive processes, hence it is inferred that the internal secretions of these glands have been modified, and, in consequence, medicinal extracts made from the glands are also changed. Therapeutic failures often follow the use of these inferior extracts, which supply the market, to the exclusion of others, because they are commercially profitable. They are manufactured, as a side product, at the great abattoirs where beasts are slaughtered for food, and hence come chiefly from castrated animals; and, as the glands from intact animals are not kept separately, the whole product is reduced to the grade of that which has an objectionable origin. The author reinforces his deductive argument by presenting clinical evidence, showing the therapeutic advantages of administering glandular solutions made aseptically from the organs of healthy, unmutilated animals, killed at the period of their greatest vigor.

The subject is worthy of an exhaustive investigation. A thorough-going inquiry would entail considerable expense; for, if the animals are kept intact, the money value of their flesh will be much lessened; indeed, their muscular tissue will become a by-product nearly on a par with hides and fat. This cost stands in the way of a proper investigation by private effort; but the work could be done in an admirable way by one of our endowed institutes devoted to research. Such an institution could prepare glandular extracts of both kinds and distribute them to clinicians, who could make tests under the best conditions and sufficiently numerous to furnish the premises for a positive conclusion. A conclusion reached in this way would be accepted by the profession, here and abroad, and might bring about a most beneficent change in our treatment of some of the worst diseases.

SENSITIZED VACCINES (SEROBACTERINS)

Dr. M. H. Gordon presented his views on sensitized vaccines before the therapeutic section of the Royal Society of Medicine. By a sensitized vaccine is understood that the bacteria giving rise to a specific disease are treated with immunized serum to absorb the immune body, and thus assist the tissues in taking up for their own protection

the bacteria after injection. Before sensitizing, the bacteria may or may not be killed. This form of bacterial therapy has rapidly grown in favor among physicians during the past year, on account of the quickness of its action, but sufficient time since the introduction of this method has not yet elapsed for any one to state its true place among therapeutic agents in the treatment of the infectious diseases.

Immune sera may cause anaphylactic shock, and with vaccines there are the dangers resulting from the negative phase. That more and more importance is given to anaphylaxis is shown by Elschnig believing this to be the cause of sympathetic ophthalmia. If horse serum is injected into the parenchyma of the cornea of a rabbit, the eye rapidly regains its usual appearance, but if, after the space of a fortnight, the serum is injected subcutaneously, the appearance of the eye to which the serum was first given shows the condition of interstitial keratitis.

Serum Disease.—L. Axenow (*Jahrbuch f. Kinderheilk.*, vol. lxxviii, No. 5) has tabulated 683 cases of serum disease occurring in St. Petersburg, with a mortality of 8.5 per cent. Serotherapy in scarlatina by means of Miser's serum should be employed only in cases which do not yield to other modes of treatment.

ABDERHALDEN'S SERUM DIAGNOSIS OF PREGNANCY

The principle upon which Abderhalden's test is founded is the reaction of the blood to foreign substances introduced from without. The proteins contained in placental tissue thus produce a specific ferment, and this can be detected in the blood-serum of pregnant women from the seventh week of pregnancy up to 15 days after delivery. The test depends, of course, upon the presence of chorionic villi in the blood and tissues of the patient, causing the production of a special ferment capable of bringing about their disintegration.

There are two methods of making the test:

In one of these methods, serum is allowed to act upon placenta in a dialyzing tube and the dialyzed fluid is then tested with the biuret reaction or the more delicate ninhydrin reaction for peptone. Though apparently simple, the method requires a careful and exact technic. The serum of the patient to be tested must be withdrawn while she is fasting, and all aseptic precautions should be observed. Great care

is necessary that there is no admixture with red cells and that no haemolysis has taken place. The amounts employed are generally 1 to 1.5 Cc. The placenta must be entirely freed from blood and should be boiled with twice the amount of distilled water for five minutes. The water is then to be tested with ninhydrin (1 per cent. solution). If only a trace of blue discolouration occurs if 5 Cc. of the water are boiled with 1 Cc. of the test solution for one minute, the placenta is not suited. The dialyzing tubes are to be carefully tested every eight days for their permeability. The actual test requires a dialyzation for 16 to 24 hours at 37° C. against 20 Cc. distilled water; then 10 Cc. of the dialysate are boiled with 0.2 Cc. of a 1 per cent. solution of ninhydrin for one minute. The presence of decomposition products is apparent by a blue discolouration, that often only shows well after the fluid has cooled. It is therefore best not to read off the reaction before 30 minutes.

The optic method is simpler and less apt to be misleading, but requires a good polariscope. One cubic centimetre of serum is mixed with one cubic centimetre of a 5 per cent. solution of placenta peptone in physiological salt solution. When the mixture has reached the temperature of 37° C. the degree of deviation is determined, and is then accurately controlled from time to time during the next 48 hours. Variations over 0.04° are to be regarded as positive. The mixture should not be turbid. Haemolytic, lipæmic, or decomposed sera are unsuited for the test. The dialyzation method has no place in general practice on account of the expense of the polariscope and the scientific training needed to take the readings.

The Abderhalden test is exciting at the present time a great deal of interest, and there seems no doubt that by its means it is possible to distinguish between the healthy pregnant and the healthy non-pregnant woman. It is true that the results so far obtained are far from uniform or entirely satisfactory, but this may well be explained by the fact that the method requires very great care in its use and an intimate knowledge of laboratory methods. The more carefully the elaborate technic which the author of this test has now evolved is followed, the more certain and free from error are the results obtained, and in the hands of competent workers there seems no doubt that the test is accurate and of fair value. In a paper read by Dr. R. L. Mackenzie Wallis and Dr. Herbert Williamson before the Section

of Obstetrics and Gynaecology of the Royal Society of Medicine clinical details of 16 cases were given in which the test had been applied for purposes of diagnosis. The deductions drawn were correct in 12, incorrect in two, and still in doubt in the remaining two cases. Although it is hardly likely that this test will ever have much more than a theoretical value in the diagnosis of pregnancy, yet the work upon which it is founded is of the greatest possible importance, because it seems to open up a large field of research in other diseases in which fermentations are formed, and it also offers a possible method for obtaining further information on the subject of the so-called toxæmias of pregnancy. A similar test has recently been employed in the diagnosis of carcinoma, and in a paper in the *Lancet*, Nov. 15, 1913, Mr. R. St. Leger Brockman describes a series of 25 cases of carcinoma in which a positive result was obtained. Indeed, as he points out, some German observers claim that a differentiation between carcinoma and sarcoma can be made by this method. The blood in those affected with cancer has a proteolytic action on carcinomatous tissue, and on this variety of tissue only.—*Lancet and Merck's Archives*.

A. Scherer (*Berl. klin. Woch.*, No. 47, November 24, 1913, p. 2183) concludes an article on "Abderhalden's Method" by stating that it is of value in differentiating between myoma and pregnancy, in a retroflected uterus, in extremely fat persons, and in the differential diagnosis between extra-uterine pregnancy and tumors of the adnexa.

Cancer of the Breast.—That repeated trauma from muscular strain of the pectoral muscles may be a cause of mammary cancer, in many instances, is suggested by the fact that in the women's suit department of a large department store eight of the saleswomen had undergone ablation of one or both breasts. The duties of these women included lifting boxes containing heavy suits from showcases to shelves that were frequently higher than the heads of the salespeople, and also removing them from the shelves to the tables. The proportion which these eight bore to the total number of employees in that department is not certain.

SURGERY

Surgery to be Routed by Medicine.—At a clinic at the Mercy Hospital, Chicago, in November, Dr. John B. Murphy made the prediction that in the next 25 years internal medicine will surpass surgery

in its value to the human race,—not internal medicine, as practised by feeling the pulse, looking at the tongue, and patting the patient's head, but by attention to details, analysis, and attempts at diagnosis, followed by the cure of the patient before he has been made aware of his symptoms.

Flat-foot.—G. E. Moulton, of the University of Illinois (*Amer. Phys. Education Review*, see *Literary Digest*, July, 1913), holds that pigeon-toes are a thing to be desired, as they compel one to bear the weight on the outer edge of the foot, and thus prevent breaking-down of the arch. Prolonged standing on the feet, as in housework while washing, ironing, or baking, without actual work for the muscles of the foot, is conducive to strain on the arch. The modish high-heeled shoe is condemned, as is also the artificial support of the arch, which leads to weakening of the muscles and to undue pressure on the blood-vessels of the under side of the foot.

Anæsthetics.—Twenty years ago the war waged furiously over the use of ether or chloroform in producing anæsthesia, which was the safer, and how did the anæsthetic produce death when the patient succumbed. First, there is a wide range of methods to select from, and the anæsthetic-association of Crile and the acapnia theory of Henderson must be taken into consideration. The prevention of shock, and the adaptation of the method used to the one giving it and the one receiving it, are all-important. As is well known, adrenalin produces ischæmia, and, when added to novocaine, makes a lessened amount of the drug necessary to produce anæsthesia. The regional method of Brain was reported on at the International Medical Congress, thus making it possible to block all sensory constriction from the injured tissues, as in the case of fracture of the humerus by injecting the brachial plexus. Earle (*Interstate Jr.*, Feb. 13, 1913) reports extensive sloughing following the use of the hydrochloride of urea and quinine in one of his patients.

Intratracheal insufflation has gained ground, doing away with the expensive and elaborate rooms specially constructed in order to maintain intrapulmonary pressure.

Induction of general anæsthesia (Ellen J. Patterson, Pittsburgh, *Annals of Surgery*, November, 1913) is often greatly delayed by the rattling of mucus in the pharynx and the struggle to breathe that accompanies it. In the Clinic of Chevalier Jackson, in Pittsburgh,

the following procedure has met with success. The head of the patient is extended, as for direct bronchoscopy, and so maintained. The index-finger of the operator is now introduced deeply behind the hyoid bone and pressed strongly upward, as though to lift the neck on the tip of the index-finger. The result is immediate improvement, the patient drawing a deep breath, and acting as though subsiding into normal sleep. This procedure is not new, having been carried out in the clinic for some years, but is seldom resorted to elsewhere.

Gwathmey's Oil-Ether Rectal Anæsthesia.—The administration of ether vapor by rectum, for surgical narcosis, which at one time was thoroughly studied, never acquired general recognition and has, indeed, fallen quite into disuse. This was largely because of the severe proctitis that so often resulted. To obviate this and retain the advantages of anæsthesia by this route, Gwathmey (*N. Y. Medical Journal*, December 6, 1913) has devised a simple method by which he introduces into the rectum liquid ether in which is mixed (dissolved) a quantity of olive oil, varying inversely with the patient's age. The dose is regulated according to the age and weight of the patient. In children below six years of age a 50 per cent. solution is employed. It is increased in strength in older patients, and above the age of 15 years a 75 per cent. mixture is employed. As a general rule, about one ounce of the mixture is given for every 20 pounds of weight. The preparation of the patient is the same as for any operation, emphasis being laid upon thorough cleansing of the rectum. The mixture is poured into the rectum very slowly; through a catheter and funnel; about five minutes is consumed in pouring in eight ounces, the amount usually required. Anæsthesia begins in about five to twenty minutes. If cyanosis or embarrassed respiration ensues, which are signs of an overdose, it is merely necessary to evacuate some or all of the mixture. After the operation, the rectum is washed out and some olive oil is poured in.

Gwathmey presents the advantages of this method as follows:

- (1) The element of apprehension and fear caused by placing a mask over the face in inhalation anæsthesia is avoided.
- (2) No expensive apparatus is required.
- (3) The after-effects of the anæsthetic are reduced to a minimum.
- (4) A more complete relaxation is secured than with any other known method of administration.

(5) The limits of safety are widely extended, compared with other methods.

(6) A more even plane of surgical anæsthesia is automatically maintained than is possible by any inhalation method—unless administered by a skilled anæsthetist using a perfected apparatus.

He refers to no disadvantages. His report was based on a series of 100 cases. In all of these the method was entirely successful, and there was no evil result. There was one death, that of an old man, twenty-four hours after the operation, probably not due to the narcosis.

This appears to be a satisfactory initial record of a procedure of such tempting simplicity that it would make unnecessary the services of an expert anæsthetist.

We often find in medicine, however, that innovations which appear quite satisfactory to their introducers, and, at first, to others, develop defects on fuller observation. Gwathmey himself presents his report modestly and with the conservative observation that further trial is necessary. If a few hundred or thousand cases show that the procedure is as free from danger as it is simple, it will be one of the most valuable contributions to the science and art of anæsthesia that has been made in many years.—W. M. Brickner, *Amer. Jr. Surgery*, Feb., 1914.

FRACTURES

The operative treatment of fractures with fixation of fragments by screws or pins, either metallic or osseous, has not fulfilled the enthusiastic hopes of those who introduced it; but the consensus of present opinion regards it as a valuable measure in selected cases and with specially strict asepsis.

W. W. Grant, of Denver (*J. A. M. A.*, May 3, 1913, p. 1394), has summed up the indications for this procedure: "The larger the external wound, the greater becomes the danger of infection and the need for operation; but the penetration of the skin by a spicula of bone is not necessarily a justification for instrumental interference. When dirt and filth have been ground into the wound, as often happens in railroad and mining traumatism, operation should not be delayed. In open patella fractures it should be immediate; also when there is separation of the epiphysis of long bones, especially when complicated with

dislocation. Noticeable deformity and functional incompetence, not otherwise remediable, demand an operation. In closed, or simple, fractures, when a fairly accurate adjustment of the fragments cannot be secured or maintained and where there is perceptible deformity, it is best to operate. In fractures of the tibia and fibula immediately above the ankle, so often followed by restriction of movement, a judicious operation gives the best prospect of good results, both anatomical and functional."

*Fractures.*¹—The treatment of fractures is probably as old as man himself, and for at least as long a time as we have satisfactory records it has not varied in the principles involved: 1st, reduction of the fragments; 2d, immobilization (retention of the reduction) for a greater or less period, and 3d, the prevention of disability. Attention to the third principle has considerably altered the practice of the second; and efforts more thoroughly to apply the first have introduced new methods of traction, and the exposure of the fragments to vision and direct manipulation.

But whatever the mode by which these principles are applied, the union of the bone, like the healing of other tissues, must be left to Nature. Artificial means may encourage or stimulate that healing; but also they may retard it. And this, in our opinion, is one of the objections to certain types of open operation, as pointed out by Magruder and by us elsewhere in this issue.

The greatest of all the contributions to the management of fractures is, of course, the X-ray; and it would be platitudinous to repeat here the various reasons why radiography should be invoked as a routine in the treatment of fractures and in the diagnosis of all those conditions in which, by reason of direct or indirect violence, a fracture may be present.

Curiously enough, in spite of all we have learned from the innumerable radiographs that have been made in nearly two decades, they have discovered, as far as we can now recall, no hitherto unknown variety of fracture—except that of the base of the fifth metatarsal from indirect violence, described some few years ago by Robert Jones.

¹ Editorial by Dr. Walter M. Brickner, in the Fracture number (January, 1914) of the *Amer. Jr. of Surgery*.

Radiography has emphasized what, to be sure, was known before, viz., that perfect reduction is not essential to good function. Equally important is its teaching that perfect reduction is rarely accomplished even by open treatment. Nevertheless not a few surgeons, perhaps in an effort to approach perfection, have advised the more or less routine operative management of a wide variety of fractures. Most surgeons, however, have more wisely recognized as the legitimate field for radical measures those cases only in which, without them, function is, or threatens to be, impaired. This attitude is gaining in acceptation, as the reports of the British and American Fracture Commissions indicate, and the articles in this issue of the *Journal* demonstrate.

The operative treatment of fractures is not new; it has been a familiar practice on the patella, the olecranon and at other sites. It has grown, however, with improvements in technic, the invention of bone levering and holding instruments, and the addition to suturing, wiring and nailing of other, more rigid fixation devices.

It is in fracture of the adult femur shaft that radical treatment has its least-disputed claims to superiority. Here the contraction of large muscle masses usually produces an amount of overriding, and corresponding shortening of the extremity, that manual traction, however vigorous, will not overcome. The adhesive-plaster-and-bandage traction of the now old-fashioned Buck's extension apparatus is also usually quite unsatisfactory. Even if the excellent traction apparatus of Lemon or the powerful one of Lambotte reduces the overriding in a single sitting, the plaster cast may fail to maintain the reduction. Hence there developed, in Europe, efforts to apply, more directly, continuous traction or distraction by the "closed," "semi-operative," and "open" methods that have been associated with the names of Codivilla, Steinmann, Lambret, Hackenbruch, Bradenheuer.

The immediate fixation of the deliberately exposed fractured ends is by no means new in surgery. The older, and still often and successfully applied, methods were by wire (and other sutures), screws, nails and occasionally bands. These have the drawbacks, however, that they not only often fail to hold the bones but also that, producing rarefaction at the fracture lines, they may cause non-union. Arbuthnot Lane sought to overcome these objections by developing

the occasionally and unsatisfactorily used metal strip into a long and strong plate, by fastening it to the bone with comparatively short, full-threaded screws placed at some little distance from the fracture line, and by establishing reliable technics of asepsis and manipulation. The Lane plate and Sherman's vanadium steel plate and special screws have secured some excellent results in the hands of their authors and of many other surgeons.

In the opinion of most competent observers, with which Lane disagrees, bone plating delays the period of healing. This objection, while of economic import, would not in itself be very serious, if there were no others.

Animal tissues are intolerant of foreign bodies. That in many cases bone plates have been borne in entire comfort for long periods (perhaps indefinitely) does not disprove the rule. In a very large percentage of cases, the figures varying with different surgeons, the plates have sooner or later given trouble and had to be removed. To secure the immediate mechanical advantages of the plate and avoid the necessity for removal by a second operation, there have been evolved "external plates" and clamps, of which those of Lambotte and Parkhill are prominent examples. These, too, have proven useful, but they possess the objections inherent to the insertion of bone screws and the possible dangers of infecting the bone through open wounds.

The frequent necessity of removing them might also be excused in the mechanical advantages of the Lane plates, if there were not still other objections. In addition to such accidents as refracture through a screw hole, suppuration with resultant osteomyelitis or sepsis, etc. (which may be largely attributable to faulty technic), the mere presence, in and on the bone, of the metallic screws and plate may, we believe, not only retard but actually prevent bone healing.

To replace the metal plate or clamp with a non-irritating and physiologically acceptable substitute is a great desideratum. To the extent of its limited strength, the autoplastic bone splint-graft is the ideal substitute, for it not only does not inhibit but actually stimulates healing. It has been used in two ways: as a cortical graft, mortised into the shaft (Albee); and as an intramedullary splint (Murphy), in the same manner as the now discarded intramedullary splints of metal and ivory.

In cases of non-union without displacement, the employment of an autoplastic bone graft, not as a splint but merely as a stimulant of osteogenesis, seems to be quite a rational form of treatment in fractures.

That the open treatment of fractures should not be undertaken by those who have not the experience, the tools, the competent assistance, and the rigidly aseptic environment that are essential to success, need not be interpreted to the discouragement of the ambitious and capable man who has the opportunities but not the training; for if he is willing to make the effort to secure the one he may put himself in the position to enjoy the other. Excluding, of course, the emergencies of depressed skull- and compound fractures, the open operation is never urgent. The patient can only benefit by such delay as may be needed to provide him with the proper environment of surgeons, tools, and technic.

After all, the radical methods are only a small and special part of the vast amount of fracture work that falls to the duties of surgeons and general practitioners. And the increasing literature of that small and special part should not belittle the dignity nor obscure the importance of the larger part. The management of the "every-day fractures" is a serious, delicate task that involves experience, diagnostic sense, conscientiousness, mechanical dexterity, and painstaking attention, both during and after healing, to prevent deformity and to avoid functional disability. It is one of the finest of the surgeon's arts, more difficult and more exacting than much that is glorified as abdominal surgery.

Fractures of the Neck of the Femur.—Whitman treats these fractures in the position of abduction: "The patient is anæsthetized and placed on a sacral support, and then an assistant abducts the sound limb to the anatomical limit so as to demonstrate the normal range, which varies in different persons, and this also serves to fix the pelvis. Then the thigh on the affected side is flexed to disengage the fragments. The hip is then extended and longitudinal traction is made to overcome the shortening. The limb is rotated somewhat inwards and is abducted to the normal limit, as shown by the thigh of the other side. In this position the fractured bone is fixed by a plaster spica, extending down the limb as far as the ankle."

Grafting of Limbs from Criminals.—When the three motor ban-

dits were executed in Paris and their bodies, after mock burial, were turned over to the Faculty of Medicine, much discontent was expressed because of delay in their receipt, which prevented sensational experiments in grafting, not only organs, but entire limbs, as advocated by the doctors of the Beaujean Hospital.

The question has been mooted whether patients in the hospitals of Paris would care to be supplied with the arm or leg of a criminal, say of an arm in the case of a pickpocket, owing to possible moral consequences! Might not the State, too, construe this as a partial evasion of the death penalty, the more especially if the testicles or ovaries are the organs chosen for transplantation? The question at once suggests itself, Who will be the real father of the child in case conception takes place from a spermatozoon originating in the transplanted testicle?

Trepanation in Softening or Hemorrhage of the Brain.—Prof. Pierre Marie, of the Salpêtrière Hospital, Paris, France, demonstrated that in these cases trepanation brought relief, and held out hope of a cure. It should be done on the side opposite the lesion, otherwise there was risk of aggravation.

Sterilization of the Skin.—The use of iodine for this purpose preparatory to operation has of late become very popular. Hunter Robb, of Cleveland (*Surg., Gynæc. and Obstet.*, September), concludes an interesting report as follows: "There is still no certain method of sterilizing the skin. Tincture of iodine, in all probability, possesses a definite inhibitory action on bacterial growth, but is not to be relied upon, and should be used only when more elaborate forms of sterilization are contra-indicated."

Felons.—Felons, infected fingers, and palmar abscesses are the source of as much trouble to the general practitioner as any surgical ailment he may meet. In the *Annals of Surgery* Hoon and Ross describe their experience with Kanavel's method, call it a radical departure from former modes of treatment, and claim brilliant results. Felons seen before osteoperiostitis had occurred were arrested by a deep lateral incision through the periosteum, and dressing for a couple of days with hot 4 per cent. boric acid compresses. Six fascial spaces exist in the hand, their names being self-explanatory: dorsal subcutaneous, dorsal subaponeurotic, thenar, hypothenar, middle palmar, and web space.

To open the tendon sheaths of the fingers, incise laterally along the proximal and middle phalanges and, if necessary, opposite the proximal interphalangeal joint. The thenar tendon sheath may be incised to one thumb's-breadth anterior to the anterior annular ligament in order to avoid the motor nerve of the thumb, and the hypothenar from the base of the little finger to the anterior annular ligament. To incise the ulnar or radial bursa, make an incision one and one-half inches above the tip of the ulna down to the flexor surface of the ulna, pass a closed haemostat across the ulna, radius, and pronator, and cut to meet it on the radial side. Enlarge both incisions to one and one-half inches. To open the midpalmar space, cut into the lumbrical canal between the middle and ring fingers, extending the incision one and one-half thumb's-breadths up the palm, and thrust a haemostat beneath the deep flexors to open the midpalmar space. If necessary also to open the thenar space, thrust a haemostat across the mid-metacarpal and through the partition between this and the thenar space to the dorsum of the hand between the first and second metacarpals. Make a counter-incision and insert a rubber-dam drain for 18 hours. Do not use tubing.

To open the midpalmar and subaponeurotic, incise where the midpalmar crease crosses the space between the middle and ring metacarpals. Thrust a haemostat to the dorsum and make a counter-opening. For the thenar space, make an incision on the dorsum on the radial side of the second metacarpal opposite the middle of the bone on a level with the flexor surface. Thrust a haemostat into the thenar space, being careful not to go beyond the middle metacarpal. No counter-incision is needed. For the subaponeurotic space, make incisions on the dorsum in the interosseous spaces. The hypothenar space is reached by direct incision into it.

Passive motion is begun two days after operation. Hot boric dressings are applied for three days, and afterward dry dressings.

Renal Tuberculosis.—The diagnosis of renal tuberculosis is frequently a matter of doubt until the organ is visible, either in the operating room or on the autopsy table. Urinary examination is often negative when an affirmative response is expected. On several occasions when no urinary evidence of tubercular infection could be found, Leo Ruerger (*Amer. Jour. Surg.*) removed small pieces of mucous membrane from the ureteral orifice, using, of course,

an operating cystoscope to enable him to see and reach the part in question, and these specimens have permitted a positive diagnosis to be made.

APPENDICITIS

Mr. Edmund Owen's dictum is "look and see," thus expressing his adherence to the rule of early operation. Cases of traumatic appendicitis are being regularly reported, while Mr. W. H. Battle has reported four cases of pigmented appendix in which the blackish discoloration was due to iron and was situated in the mucous membrane. The sulphide of lead may give rise to a similar pigmented appendix.

Meltzer's Sign.—This sign (*Amer. Jour. Surg.*, September, 1913), of excellent diagnostic value, is not as generally known as it should be. It is elicited by putting the patient in a supine position and pressing firmly with the finger-tips on McBurney's point; the patient then raises the right thigh *with the knee fully extended*, but if such movement be inhibited by, or cause, severe pain, appendicitis is strongly suggested, the organ being compressed between the contracting psoas muscle and the examiner's fingers.

The sign is not in itself diagnostic, pain being slight or absent in some cases, also because it may be marked even without appendicitis. It is always advisable, therefore, *to make a comparative test on the left side.*

Pseudo-Appendicitis.—In many patients presenting the classical symptoms of appendicitis the removal of the organ gives no relief. George R. White, of Savannah (*Annals of Surgery*, October), has found seven instances in which a contracture of the psoas parvus was the condition at fault. The diagnosis could only be made positive by exploratory incision. Division of the tendon and resisting fibres resulted in a cure.

Operative Relief of Gastric Crises in Locomotor Ataxia.—Resection of the sensory roots of the spinal nerves for the relief of the pains of locomotor ataxia has been performed by several surgeons, and Charles H. Frazier (*Amer. Jour. Med. Sci.*, January, 1913) reports a successful case. Gastric crises accompanied by vomiting were checked, and the patient is gaining weight.

Aural Vertigo.—In a case of obstinate aural vertigo, Charles H.

Frazier (*Surg., Gynaec. and Obstet.*, November, 1912) divided the auditory nerve intracranially with partial relief of the symptoms. He thinks cases of labyrinthine origin suitable ones for the procedure if the condition incapacitates the patient.

Submucous Resection.—Some operators advocate the replacement of the cartilaginous septum after its removal. G. C. Kneedler, of Pittsburgh (*Laryngoscope*, October), reports 58 cases in which he has successfully followed this procedure. The cartilage is removed, placed in warm normal saline solution, and finally trimmed straight and replaced.

Mouth Breathing.—Parents invariably expect complete cessation of mouth breathing after adenectomy operations. But this will not follow in cases where the septum is much disturbed, nor when there is a high arch of the palate, or faulty coaptation of the teeth. H. M. McClanahan, of Omaha (*Archives of Pediatrics*, October), reports his studies of this condition, and states that he can tell by inspection which cases will fail to improve promptly. Of course, these require operation, and will improve somewhat, but the cure will not be complete.

The Ethmoid Labyrinth.—In man a ridge over the agger nasi cell marks the rudiment of a turbinate found in some of the lower animals. The forcing of an ethmoid curette through the bone at this point gives entrance to the cell and, according to Harris Peyton Mosher, of Boston (*Laryngoscope*, September, 1913), is an unusually satisfactory path of entry to the ethmoidal labyrinth and frontal sinus, permitting the exenteration of the former in a very thorough manner. He strongly recommends it as a path in catheterizing the frontal sinus.

The Lingual Tonsil.—Morning nausea and cough, which is persistent in the morning and spasmodic through the daytime or at night, with or without expectoration, and with a sensation as of a foreign body in the throat, are among the misleading and not unusual symptoms of enlarged lingual tonsil (*Amer. Jour. Surg.*, August). This has only during the last few years been recognized by the profession. The symptoms are apt to be wrongly interpreted, or no conclusion may be arrived at. Treatment is by removal of the excess tissue while under direct inspection, the location not admitting of cutting when the parts are only partially visible because of blood or for any other reason.

Tonsillectomy by Eversion.—A new method of tonsillectomy is described by Bryan D. Sheedy (*Jour. Med. Assoc.*, September 27). The operation is the same in principle as the Sluder operation; but, instead of forcing the tonsil from its bed, it is seized and everted, much, the author states, as though a uterus were inverted by pulling on the placenta. As in other methods, it is necessary to free the margins from the pillars by a shallow incision, after which the author proceeds with the snare. If the operation can be carried out as frequently as he thinks, it is preferable to the Sluder method.

Congenital Pyloric Stenosis.—Pyloric stenosis in infants has of late attracted considerable attention. An apparently healthy infant commences to vomit after nursing. It is probably merely a little regurgitation of food, which may be delayed until several feedings have accumulated, and later becomes expulsive. The stomach dilates; the hypogastrium becomes seaphoid: and, after feeding, the peristaltic wave of the dilated stomach can be plainly seen through the thin abdominal wall. The pyloric tumor can at times be felt, but as the liver is always enlarged it usually obscures the pylorus. The classic picture of marasmus follows the persistence of the condition. Levi J. Hammond (*Ther. Gaz.*, October) reports four successful gastro-enterostomies for the condition, the patients ranging in age from six weeks to 60 days.

Suppuration of the Antrum of Highmore.—Treatment of the ostium, or puncture and irrigation through a Litzwitz needle, will cure the majority of acute attacks; but chronic cases require an opening as large as a ten-cent piece through which there must be daily irrigation.

In order to make and maintain such an opening, E. B. Gleason (*Monthly Cyclopedia*, July) has devised a double-ended rasp which he introduces through the ostium, under cocaine anaesthesia, as soon as he is assured that pus is present, by exploring it through a Litzwitz needle. This rasp quickly cuts the opening, and may be used to enlarge it if healing commences too early.

Rectocele.—No treatment has been an unqualified success. In recent years the Emmett operation, or some modification of it, is satisfactory; but in old cases there is practically a hernia of the rectum. Dr. George Gray Ward, of New York (*Jour. Amer. Med. Assoc.*, March 29), separates the rectum from the vagina, and sutures the

crest of the rectal pouch to the upper third of the vaginal wall. He then excises the customary triangle in the posterior vaginal wall, and passes a few sutures in the upper portion of it. Next he opens the inferior vaginal sulci, catches in them the separated margins of the levator ani, and sutures these and also the overlying fascia, laying stress on this use of the fascia for support. The rest of the vaginal incision is now closed and, finally, a few silkworm stay sutures passed, the others being of catgut, made intravaginally.

Paralysis of the Bladder.—In a case of severe traumatism followed by paraplegia with incontinence of urine and faeces, reported by Charles K. Mills and Charles H. Frazier (*Jour. Amer. Med. Assoc.*, December 21, 1912), partial recovery from the paraplegia and anaesthesia took place. To relieve the incontinence, intradural anastomosis of the first lumbar and third and fourth sacral roots was performed. This was so far successful that eight months afterward the patient could hold the urine 12 hours, and by suprapubic pressure could partially empty the bladder.

The Suturing of Severed Arteries.—According to Ernst Unger,² of Berlin, the ends of a severed artery may be united when not over two inches (5 cm.) apart. Should the distance be greater than this, a portion of a vein may be employed for the purpose of carrying arterial blood. Unger reports three cases in detail, two of which were successful where this principle was made use of. In one patient after the extirpation of a large popliteal aneurism the cut ends of the femoral artery and the anterior tibial were successfully united by a six-inch (15 cm.) strip of the saphenous vein.

This form of surgery will no doubt play an important part in future warfare where there will always be fresh tissues available from those killed in battle, and one can well imagine a successful city surgeon in private practice having his patients collected near the field of battle so as to have an abundance of fresh material to replace a kidney here, a testicle there. Then, too, representatives of the cold storage surgical supply houses could have their agents ready to replenish their stock in trade.

Transplantation of the Testicle.—An instance in which this was successfully done, the organ functioning for two years after the operation, is reported by Victor D. Lespinasse, of Chicago (*Jour. Amer.*

² *Berl. klin. Wochenschrift*, No. 24, 1913.

Med. Assoc., November 22). A testicle was removed from its owner, slices were taken from it, and transplanted directly into the man who was in need of them,—two grafts into the rectus femoris and one into the empty scrotum. In this instance the recipient had lost both testicles, and the return of sexual power was positive proof of the success of the operation.

Skin-grafting.—Dr. G. Lenthal Cheatle (*Lancet*, June 21, 1913, p. 1763) maintains that skin-grafting is better without dressings, as the so-called antiseptic gauzes are often faulty. He cites one of his own cases in which he skin-grafted an ulcer which had remained after extensive removal of the left breast. He made a little cage covered with double cyanide gauze, and found that complete healing took place.

According to Maximilian Stern, of New York (*Jour. Amer. Med. Assoc.*, March 29), amniotic membrane forms a satisfactory material for skin-grafting. He finds it important that the glistening amniotic side be brought into contact with the ulcer.

Acute Osteomyelitis.—A plea for more attention to cases of this disease which are apparently of rheumatic origin is made by John H. Gibbon (*Penna. Med. Jour.*, December, 1912). The affection is almost wholly confined to childhood. Localized pain and tenderness with rigidity first attract our attention, and if there be redness and edema the diagnosis is certain. In some cases overwhelming constitutional symptoms usher in the disease. The X-ray is useless for diagnosis. As the inflammation begins in the medulla, periosteal incision is of no benefit; the bone should be freely opened, but there should be no curettage, as this is followed by too much necrosis.

Dupuytren's Contraction Treated with Thiosinamin.—According to A. H. Tubley (*Brit. Med. Jour.*, November 8), this disappears without recurrence if the contracted fascial fibres are thoroughly dissected away, fibrolysin poured into the wound, and thoroughly rubbed in for two minutes; in cases in which the fibrosis has been extensive, two drops are injected into five or six places around the margin. The hand is now dressed in full extension on a malleable iron splint. If the fingers are so much involved that a satisfactory dissection cannot be made, he divides the fibres subcutaneously, breaks up all nodules, and injects fibrolysin. It is very important that the lines of the incisions be carefully reunited by buried horse-hair sutures. The author

has used the same method for scars, the contraction of which has caused deformity. In such instances the incisions are transverse to the scar, and extend deeply into the subcutaneous tissue. After this fibrolysin is injected in an amount as great as 20 m. for an adult or 15 for a child. In 10 to 14 days the wound is healed, and the operation should be repeated; this may be necessary three or four times.

Removal of the Spleen in Pernicious Anæmia.—Professor Huber, of Berlin (*Berl. klin. Woch.*, No. 47, November 24, 1913, p. 2179), recommends the removal of the spleen in all cases of pernicious anæmia where other methods of treatment do not give results. Before and after the operation defibrinated or fresh blood should be employed. Whether the favorable influence upon the disease will be lasting or not is uncertain, but that life may be prolonged has been demonstrated.

Subdeltoid Bursitis.—Traumatism of the shoulder is often followed by persistent disability attributed to sprain of the biceps tendon, rheumatism, etc. If localized tenderness can be elicited by pressure over the bursa, aspiration with a hypodermic syringe under the strictest aseptic precaution may confirm the diagnosis, in which case prompt relief follows such evacuation (*Jour. Amer. Med. Assoc.*, April 13, 1913).

Examination of Gastric Contents Without Stomach Tube.—H. Friedrich (*Archiv f. Verdauungskrankheiten*, vol. xix, No. 5, 1913) employs the gastrognost, a simple apparatus of his own design, to detect hydrochloric acid in the stomach contents without removing the latter by syphonage. The gastrognost consists of a thread impregnated with Congo red. On its distal end there is a metal button. The method does not only evince the presence of free hydrochloric acid, but also, whether there exists hyperacidity (dark-blue coloration), normal acidity (blue coloration), or subacidity (brown or violet coloration). After the thread is dry the differences in color become more pronounced. Unequal coloring of the thread is met with in the presence of contents that are incompletely chymified and rich in mucus,—*i.e.*, in gastritis. In case the thread appears red at the anterior end, it indicates hypermotility. In the presence of hypermotility the metal button of the gastrognost has entered the duodenum after half an hour.—Western, in *Archives of Diagnosis*.

Pignet's Factor of Physical Fitness.—As an index of physical

fitness the French military surgeon Pignet devised the following formula: $F = H - (C + W)$: in which H = height in centimetres; C = minimum chest measurement in extreme expiration, in centimetres; W = weight in kilogrammes, and F is taken as a factor, or expression, of physical fitness. The larger the excess of height over the sum of the chest measurement and the weight, expressed in the terms just stated, the poorer the physique of the subject. If this excess (F) amount to 25 or upwards, Pignet classes the subject as "weak"; if F does not exceed 20, the subject is of "good" physical development; if from 10 to 15, he is considered "strong"; and if less than 10, "very strong." Similarly, if it is 30 to 35, he is "very weak," and if over 35 a recruit is considered to be useless for military service. Col. R. H. Firth, R.A.M.C., has been recently applying this formula for estimating efficiency to various races from which are drawn recruits for our Indian army. Amongst these the Hazaras, Garhwalis, and Gurkhas give respectively 62, 51, and 44 per cent. with factors of less than 20,—i.e., "good," "strong," and "very strong"; the Hindus and Musalmans of Rajputana, the Dekhanis, and the Hindustani Hindus and Musalmans gave respectively 77, 76, and 70 per cent. with factors of 25 or more,—i.e., "weak," "very weak," or "useless." The results obtained by the use of this factor appear to corroborate the opinions generally held as to the fitness for military service of these respective races. The short, sturdy type of man gives the lowest range and the tall, lean man a correspondingly high factor. Anyone may work this out for himself and see how far he conforms to the theoretical standard of physical efficiency.—*Lancet*, September 20, 1913.

TYPHOID FEVER

As an example of the kind of work the officials at Washington are doing, we quote in full the interesting paper by Hugh de Valin, Passed Assistant Surgeon, United States Public Health Service:

*Typhoid Fever and Gastro-enteritis.*³—The *Rochester*, of the Richelieu and Ontario Steamship Company, was chartered by the Perry Centennial Commission to take a party, 300 in number, of citizens and members of various military organizations of the State of Rhode Island to attend the Perry Centennial Celebration at Put-in-Bay, Ohio, and other points. The itinerary of the trip was as follows:

³ Reprint from the Public Health Reports, vol. xxviii, No. 51, Dec. 19, 1913.

The party left Providence, R. I., at 8.30 A.M. September 8, 1913, and proceeded by train to Buffalo, N. Y., arriving at that point at 11.30 P.M. the same date. Two meals were served *en route* by the railroad company, a basket lunch put on at Springfield, Mass., and later a dinner in the dining car attached to the train. Upon arrival at Buffalo the party boarded the *Rochester* and spent the night on board, the ship remaining at Buffalo. On the morning of September 9th a trip was made by rail to Niagara Falls, the party returning to the ship at Buffalo in the afternoon. The *Rochester* sailed from Buffalo at 3 P.M. September 9th and arrived at Put-in-Bay on the morning of September 10th. At this place the party was ashore attending the centennial exercises. At 5 P.M. the *Rochester* left for Cedar Point, Ohio, arriving there at 7 P.M. A banquet was served on shore at Cedar Point and was attended by the officers of the Rhode Island military organizations and certain of the citizen members of the *Rochester* party. A few members of the party who did not attend the banquet went to Sandusky for the evening. The *Rochester* with all on board left Cedar Point at 5 A.M. on September 11th and returned to Put-in-Bay, arriving there at 7 A.M. The passengers were again ashore at this point attending the centennial exercises. At 5 P.M. the *Rochester* sailed for Detroit, Mich., arriving there at 9 P.M. This same evening, September 11th, a number of the *Rochester* party took a short trip on board the ferryboat *Promise* to Belle Isle, Detroit. A lunch was served on board. On September 12th a lunch was served at the Hotel Pontchartrain, Detroit, and was attended by practically all the members of the *Rochester* party. At 11 P.M. on September 12th the *Rochester* sailed for Buffalo, arriving there at 9 P.M. on September 13th. The party remained on board for the night, taking train for Providence on the morning of September 14th and arriving at their destination at 11 P.M. the same date. *En route* from Buffalo to Providence two meals were served by the railroad company, breakfast in the diner attached to the train and basket lunch put on board at Albany, N. Y.

Reports concerning 235 members of the party have been received, and in this number there occurred 122 cases of gastro-enteritis, and 42 cases of typhoid-like attacks, including 5 deaths.

The cases of gastro-enteritis varied in severity from those having a diarrhoea of only a few hours' duration to those in which the diarrhoea was severe, lasting for several weeks, and accompanied by more or less prostration, slight febrile course, general malaise, and gastric disturbances. The typhoid-like cases varied in type from mild paratyphoid-like attacks to cases in which there was presented a clinical picture of severe typhoid fever. These 42 cases were reported as having their respective dates of onset in the period between September 21st and October 12th. Of these, 29 gave histories of primary diarrhoea, occurring some little time before the dates on which they were considered to have had their definite onsets. Of the gastro-enteric cases, 101 gave histories of dates of onset during the period from September 9th to 15th. The remaining 19 developed on various dates from September 16th to 22d. There were 51 cases occurring on September 14th, 19 on September 13th, and 13 on September 15th, making a total of 83 for those three days, and showing that the effects of the infection were felt most acutely during that period.

Another Rhode Island party, 122 in number, on the steamship *Greyhound*, followed the same itinerary as the *Rochester* party, visiting the same points and attending the same functions on shore. In this party there occurred but 12 cases

of diarrhoea, of short duration, and since the return home there have developed no cases of gastro-enteritis or typhoid.

Careful inquiry on all points showed no probability of the infection, which caused the outbreak, having been acquired on shore at any of the places visited. The *Greyhound* party served as a valuable control in the elimination of any probable factors other than those which may have existed on the *Rochester* itself, as the trips of the two parties, with the exception of the time spent on board their respective ships, were practically identical.

The investigation brought out the fact that there had been numerous cases of more or less persistent diarrhoea among the *Rochester*'s crew, not only on this trip, but during the entire season. Four cases of typhoid fever among the crew were also reported in the persons of an electrician who was admitted to hospital on August 16th, a stewardess who left the ship "ailing" on September 20th and was admitted to hospital as a typhoid case on October 10th and subsequently died, a water tender who was feeling badly when he left the ship on September 20th and was later diagnosed as a case of typhoid, and a meat cook who was admitted to the United States Marine Hospital, Buffalo, N. Y., on September 15th in the febrile stage of the disease.

As outbreaks, similar to the one which occurred among the *Rochester*'s passengers, directly traceable to infection by sewage-polluted drinking water, have occurred from time to time on various ships operating on the Great Lakes and in cities which derive their water supplies from the Lakes, an investigation as to the drinking water used on board the *Rochester* during the trip in question was made. The capacity of the water tanks on board not being great enough to permit the carrying of a sufficient supply to last during an entire trip of this character, it was necessary to take on water several times at a number of different places. The chief engineer of the *Rochester* stated that water was taken on direct from Lake Erie on at least six different occasions on certain dates while the ship was on certain definite courses.

Results of thorough examinations of Lake Erie water, which have been made from time to time, show that several of the stated sources of the *Rochester*'s drinking water may be considered questionable as to safety; and the water stated as having been taken on board on September 11th, half way between Cedar Point and Put-in-Bay, and again on the same date, between Put-in-Bay and Detroit half way to Bar Point Light, is considered to have been obtained not only from a decidedly unsafe source, but from an area which shows frequent sewage pollution.

In reference to the meat cook above mentioned as having been admitted to hospital with typhoid fever on September 15th, it may be stated that this man gave history of having been ill with the disease since about September 1 and of having had a more or less profuse diarrhoea not only during the trip but for some time previous. While the ship was in Detroit on September 12th he consulted a physician, and at that time was found to be running a febrile course. However, no definite diagnosis of typhoid was made at that time. According to his statement, he had worked in the ship's galley, where all food was handled and prepared, during the trip, until the afternoon of September 11th, when he felt so badly that he had to lay off and go to bed. During the trip he cooked meats, made soups, gravies, and *entrées*, and occasionally helped with the salads.

Taking into consideration the various facts which were developed during the course of the investigation, I am of the opinion that the factors which may be

considered as operative in causing the outbreak are sewage-polluted water taken on board at some point and furnished to passengers and crew for drinking purposes, and the presence of the meat cook, with profuse diarrhoea and in the febrile stage of typhoid fever, in the galley during the major portion of the trip, where food was handled and prepared for all on board.

PLAQUE

Two human cases of plague, both fatal, were reported in California during 1913, and three out of four cabin boys on a steamer arriving from the River Plate at Tyne also died of the disease. In the first instances the ground squirrel is held responsible, while in the latter case a pet rabbit which had become infested with fleas.

YELLOW FEVER

The English West African dependencies (*Lancet*, April 26, 1913, p. 1178) have provided a fund for a study into the nature of the fevers occurring amongst the Europeans, natives, and others in West Africa, and their relative frequency, especially yellow fever and its minor manifestations. The centres for study are Freetown, in Sierra Leone, and Sekondi and Accra, on the Gold Coast. The coöperation of all medical men practising in the British West African dependencies has been enlisted.

LEPROSY

The United States Public Health Service (*Public Health Bulletin*, Wash., D. C., No. 61, July, 1913) issues a summary of investigations made at the leper settlement in Molokai in accordance with the Act of Congress approved March 3, 1905. These deal with glandular tuberculosis among the lepers, the danger of association with lepers at Molokai, the absence of luetin reaction on lepers showing a positive Wassermann reaction, the presence of acid-fast bacilli in the secretions and excretions of lepers, the fecundity of Hawaiian lepers, and with rat leprosy.

The Treatment of Leprosy.—P. Unna, Jr. (*Berl. klin. Woch.*, No. 46, November 17, 1913, p. 2138), considers diathermy of special value in the treatment of leprosy.

SCARLET FEVER

G. Richardson (*Edinburgh Med. Jr.*, Dec., 1913) thus described the method of eliciting the Rumpell-Leede phenomenon in scarlet fever:

A domette bandage is tied tightly around the arm immediately above the elbow, the correct pressure being such that the pulse is just perceptible above the wrist. At the end of 15 minutes, if the bandage has been properly applied, the arm should be markedly cyanosed. Should the arm become a dead mottled white, the reaction will not be obtained. When the bandage is removed the skin at the fold of the elbow on the side distal to where the bandage has been is examined for the appearance of a widely varying number of minute petechial hemorrhages, fairly deeply seated, which do not disappear on pressure, and are, in fact, made more evident by stretching the skin. The test is one of eminently practical value. Of a series of 48 cases sent in to the hospital for observation for scarlet fever there was not a single case which was negative to the test and which subsequently desquamated.—Sachs, in *Archives of Diagnosis*, January, 1914.

WHOOPING-COUGH

Several elaborate reports of the treatment of series of cases of whooping-cough with Bordet's organism have appeared during the past year. One observer notes a sharp rise in temperature after the injections, especially in such cases as seemed later on to be favorably influenced by the treatment. One of the observers stated that no such rise was observed, but all seemed agreed that the spasmodic element of the disease was favorably influenced. It is more than probable that different physicians have been working with different strains of organisms, or with the bacteria prepared under varying conditions. It appears probable that Bordet's organism is the predominating one only in the early weeks of the disease, and that at a later period of the malady treatment with a culture of that organism is useless.

DIPHTHERIA

The majority of physicians know quite well the vexatious persistence with which diphtheritic bacilli often hold their ground after the cessation of symptoms and physical signs. The patient, who feels himself a well man, grows restive under the seemingly needless restraint. Each day increases his discomfort, and he passes the discomfort on to his doctor; but still each laboratory report bears the unwelcome little

mark +. The mere sight of it is irritating. As one has wittily expressed it: "That short perpendicular line preventing the longed-for — is as hateful as the bar sinister on a nobleman's coat of arms." All sorts of expedients have been tried to change this "plus" to "minus," and it seems that a really successful way has been discovered by Dr. A. Schiötz, of Roskilde, Denmark. His article, translated from the Danish, appeared in *American Medicine*, June, 1913, p. 442 *et seq.* Having observed that patients admitted to the hospital for tonsillitis never contracted diphtheria during their stay, Dr. Schiötz concluded that there was an antagonism between bacteria of the two diseases. He had a patient, who had been in the hospital three months, in whose throat the diphtheritic bacilli lingered, although for weeks the man had appeared perfectly well. From the tonsils of a patient in another ward there was prepared a culture of staphylococci, with which the faecal mucous membrane of the first patient was thoroughly painted. In less than a week the bacilli had wholly disappeared.

The result in this case caused the same application to be used in many others, and success always followed, though in a few instances two paintings were required. A slight inflammatory reaction usually occurred, but never gave any serious trouble. The method has been adopted as routine treatment in the hospital at Roskilde, subject to two precautions. The painting is never done directly from throat to throat, but an intermediary culture is always used; also, the treatment is restricted to patients of good constitution and free from intercurrent disease.

A number of American physicians have taken advantage of Dr. Schiötz's discovery, though his technic has been modified by using staphylococcal bouillon as a spray. Nearly always the procrastinating microbes have been banished, except where the diphtheria has been of nasal type. In these cases there may have been a failure to duplicate the thorough-going work of the Dane. Dr. C. E. Woodruff, U. S. Army, concludes from a review of all the evidence accumulated up to June, 1913, that: "It seems we have at last a cure for chronic carriers, who are largely, if not entirely, responsible for the dissemination and continued prevalence of this disease."

If this prove true, the time may not be distant when diphtheria will take its place side by side with yellow fever in the category of obsolete maladies.

VARICELLA

Immunization with Chicken-pox Virus.—Carl A. Kling (*Berl. klin. Woch.*, No. 45, November 10, 1913, p. 2083) has been carrying on some immunizing experiments with varicellen. The lymph is taken from a fresh pock and introduced as in vaccination. On the eighth day a red papule appears, the color of which increases in intensity for several days, and then begins to fade. Inoculations have now been carried to the sixth generation. Of the 31 children so inoculated, only one contracted the disease, while of 64 living under similar conditions, and who were not inoculated, 44, or more than two-thirds, contracted chicken-pox.

While chicken-pox is not ordinarily considered a dangerous disease, its spread in institutions, especially among the very young, is to be avoided, and we now have a method of prevention which promises to yield satisfactory results.

RABIES

Necessity of Isolation and Observation.—Drs. R. E. Allen and F. L. Horne (*Cal. State Jour. of Med.*, October, 1913) show by a case of transmitted rabies the necessity of isolation and observation for one month after apparent healing without inoculation. They had a case of a little girl who, apparently well, developed rabies 20 days after being bitten, and who, while delirious, bit her father on the index-finger where there was already a wound, thus necessitating his undergoing the Pasteur treatment.

Treatment of Hydrophobia by the Moon Method.—D. L. Harris, of St. Louis (*Jour. Amer. Med. Assoc.*, October 25), reports several fatal cases, and also one in which he followed with success the suggestion of Moon. Inability to swallow water had already appeared when the patient was given, intravenously, 15 grains of quinine and urea hydrochloride dissolved in normal saline solution. Five more such doses were given in the following 20 hours. Pain and dysphagia disappeared after the second dose, but restlessness and tremor led to the use of one half-ounce of paraldehyde. The patient was discharged cured four days after admission.

PELLAGRA

The pathology and causation of pellagra are still *sub judice* and its treatment is empirical. In the Gulf States, where this disease stands high up in the mortality list, professional opinion is coming to regard opium as the most valuable remedy, arsenic holding a secondary place (*J. A. M. A.*, May 10, 1913, pp. 1485, 1486). Physicians who had employed opium to check the debilitating diarrhoea so often present observed under its use an unexpected improvement in the other symptoms, including the dermal manifestations. Persisting with the drug, they secured a larger percentage of recoveries than under other plans of treatment. The tincture of opium appears to have been used in most cases, the dose being from ten to thirty minims, thrice daily. In favorable cases there occurred a gradual amelioration in all the symptoms, with eventual recovery; but at no stage was there any significant change which would give a clue to the true etiology. W. A. Dearman, who had induced pellagra in some of the lower animals by feeding them with the pseudomembranous deposit from the tongue, believes the disease is "a gastro-intestinal intoxication caused by a specific saprophyte, that thrives on carbohydrates and gives rise to a peculiar toxin, which causes the disturbances noted in the skin and the mucous membrane." Perhaps opium is fatal *per se* to this saprophyte.

MORBIFIC MOSQUITOES

The campaign against morbific mosquitoes continues actively under two plans: extermination and exclusion. The first requires such authority and such expenditure as relegate it to the government. A good beginning has been made in the reclamation of the Chagres River district and by work done in some British colonies; but in most tropical countries such prevention has not been undertaken by the State, and whatever is done depends upon the efforts of individuals and voluntary societies. These are concentrating their efforts upon exclusion, striving to shut out the insects from hospitals, where they get germs by biting infected patients, and also to exclude them from residences. One of the latest and best suggestions comes from T. F. G. Mayer (*Annals of Tropical Medicine*, etc., Liverpool, March 31, 1913). It is very common to ship from English ports cottages to be

used in the tropics; they are transported in sections and readily erected at the point of destination. The industry is similar to that long established in Chicago for the immediate supplying of ready-made farm houses.

Taking advantage of this commercial fact, Dr. Mayer, with the coöperation of other experts in tropical medicine, has devised a cottage which is "mosquito-proof" and which is made at only a small advance upon the usual price of like-sized structures. The material is chiefly iron, which now costs little more than wood and can not be injured by the ubiquitous white ants, that are so destructive to everything wooden. Upon a floor of concrete is erected a cage-like frame of steel bars, an imitation, in miniature, of the skeleton of a skyscraper in course of erection—a familiar sight in our large cities. There is a rain-proof roof, and below it, with an interspace, a ceiling made of sheet asbestos—a fine defence against the tropical sun heat. The wall spaces between the steel bars are filled by duplex sheets of metal, perforated by a multitude of round holes, and between the two layers is stretched the mosquito netting. This is made of a strong and durable fabric, and has a mesh just close enough to bar the passage of the insects without obstructing ventilation. There are but two doorways, one upon each side of the house, each closed by a spring door, closing automatically. The glass windows are fixtures. There is no need to open them; for the air is able to circulate freely through the walls themselves.

Such a structure is adapted to very warm climates: where protection against cold or very strong winds is desired, it is afforded by outside shutters of galvanized iron, whose overlapping sections descend from the eaves of the roof, much like the protective shutters run down at night over plate-glass windows in many of our large stores. The division of the cottage into rooms is not effected by permanent walls, but by screens and curtains—a plan probably suggested by the paper partitions of immemorial use in Japan—and the entire architecture is of tropical fashion. The main purpose, the exclusion of mosquitoes, seems to be attained as perfectly as is possible by any system of building. They have absolutely no means of entrance, unless some one passing through the doorways admits them, and this could be avoided by the employment of double doors, as in the Ancon Hospital, at Panama.

HOOK-WORM DISEASE

At the annual meeting of the State Medical Association of Mississippi (*J. A. M. A.*, May 10, 1913, p. 1485) this prevalent parasitic disease was discussed in the light of experience gathered in localities most favorable to its development: those having a damp alluvial soil and a long season of intense, almost tropical, heat. With some difference as to details, the speakers were in unison upon the most desirable treatment. It consists of free purgation by repeated doses of sulphate of magnesia, while the patient's diet is restricted to small quantities of milk or soup; in fact, it is a modification of Guelph's detergent method. After the intestinal tract has been cleared as thoroughly as possible, thymol is given in doses of from ten to twenty grains, two or three times daily. The drug is administered in capsules or in mucilage of acacia. The worms are usually destroyed in three or four days; but roborant treatment is required for some weeks to remove the anaemia which the parasites have produced. The constant wearing of shoes is claimed to be prophylactic. In this warm region the poor, both white and black, are accustomed to go barefoot, and the disease is contracted by walking unshod through barn yards occupied by cattle and over marshy ground in cow pastures.

BERI-BERI

White rice as a staple article of food is being more and more believed to be the cause of beri-beri. Indeed, the name of "vitamine," a pyrimidine base, has been given to a neuritis-preventing body found in the subpericarpal layers of the rice grain. It has been suggested to put such a high tax upon white rice in those countries where it is apt to cause beri-beri as to prevent its use by the natives.

TUBERCULOSIS

It is now just one year (February 1, 1914) since the notification and treatment of tuberculosis order of December 19, 1912, came into force in England and Wales. There all cases of tuberculosis must be reported, whether open or closed, in rich or in poor, coming under the general insurance act or being treated by the practitioner or specialist. It is hoped by this means to secure benefits both to the

afflicted patients and to the public at large, and to provide valuable statistics for future use. It will no doubt be "confidential" notification of syphilis next.

Tuberculin received some body blows at the Fifth Annual Conference of the National Association for the Prevention of Consumption, Sahli holding that the use of tuberculin for purposes of diagnosis should be condemned, and the views expressed by many of the speakers were unfavorable to its use, though Hector Mackenzie believes that when properly given tuberculin is the only thing that approaches a specific that is known to medical science.

Open-air Schools.—These schools (*Public Health Bull.*, No. 58, Wash., D. C.), now meeting with universal favor, are designed for children "predisposed to tuberculosis" and are founded on the principles of bathing, fresh air, proper clothing, diet, rest, and recreation. The school may be on a large flat roof in town, or, better, in the form of a shed in the suburbs. In winter special suits of clothing are provided. Of 51 schools reporting, 15 were wholly supported by the Board of Education, and 34 in part. When control-tests were made, the open-air children showed a greater advance than the normal children in the public schools, while in studies they not only kept up with, but nearly 50 per cent. went ahead of the latter.

The Tuberculous Nature of Varicose Veins.—Professor Landousey, dean of the Faculty of Medicine, Paris, France, has demonstrated microscopically the presence of the famous bacillus in the lesions of varicose veins, these having previously been regarded as a rheumatic manifestation. He also showed that inoculation of a guinea pig with these germs produced tuberculosis in the animal.

The Friedmann Treatment.—In Berlin, on October 25, 1913, the Friedmann cure was discussed (*Berl. klin. Woch.*, No. 45, November 10, 1913, p. 2073) by Professor Schleich, Professor Müller, Dr. Thalheim, Dr. Immelmann, Prof. Geheimrat Krause, and Dr. Friedrich Franz Friedmann himself.

A report on the present status of its investigation is issued in Reprint No. 125 from *Public Health Reports*, Washington, D. C., May, 1913. The bacillus has been found to be an acid-fast organism with properties different from any tubercle bacillus known to the investigating board of officers, although apparently identical with an organism cultivated from a few loopfuls of the material used for injection

and placed on culture media in the presence of Dr. Friedmann, who declined to furnish a larger amount for examination.

Dr. Harry Lee Barnes (*Providence Medical Journal*, November, 1913) finds, from a study of 120 cases of tuberculosis treated with Friedmann's vaccine, that:

(1) The vaccine bacilli were not always acid fast. (2) One injection of vaccine was harmless to guinea pigs and turtles. (3) Fourteen per cent. of patients had fever reactions above 100° F. (4) Inoculation indurations after first injection were present in 70 per cent. (5) The average duration of the indurations was 41 days. (6) Abscesses occurred in 23 per cent. (7) The average duration of discharge from abscesses was 23 days. (8) The cough and expectoration showed no striking improvement. (9) Bacilli persisted in the sputum in 85 per cent. of positive cases. (10) The usual appetite continued, except in reacting patients, in whom it was worse. (11) Vaccine patients lost more weight than others. (12) Twenty per cent. had improvement in chest pain, the remainder being unchanged or worse. (13) Patients had more fever and night sweats after the vaccine than before. (14) Blood spitting was at least as frequent in vaccine-treated as in other patients. (15) There was no unusual tendency toward disappearance of physical signs, which were increased in many patients who were improving before. (16) Forty per cent. of the 85 patients whose present condition is known at an average period of four months after the first injection are worse.

Dr. Barnes concludes:

(1) This report offers no evidence as to whether or not the vaccine can prevent tuberculosis in those who are free from it, as no healthy persons were inoculated. (2) It offers no evidence as to the liability of the vaccine to induce local or general tuberculosis, as this can be determined only by autopsy or special bacteriological work. (3) The one patient with joint tuberculosis showed striking improvement, which makes it desirable that similar patients who have received this vaccine should be observed and reported on by those who have had orthopædic experience. The four other patients having active tuberculosis outside the lungs have not shown unusual improvement. (4) The 120 patients having pulmonary tuberculosis have shown none of the immediate and wonderful results reported by Friedmann and others before the Berlin Medical Society. On the contrary, about 17 per cent. of the cases have shown an increased activity of the disease, which would not have been expected under ordinary sanatorium treatment. The permanent good or harm done these patients can only be measured with reasonable accuracy from one to three years after the administration of the vaccine.

Any one interested in a solution of this vexed problem as to the real worth of the Friedmann treatment will do well to read these three reports.

Calcium Content of Urine in the Diagnosis of Tuberculosis.—G. Rodillon (*Semaine Méd.*, Sept. 10, 1913) emphasizes the "de-mineralization of pre-tuberculosis." The author has worked out a test for the detection of calcium salts in the urine. Calcium, on a vegetable diet, is eliminated by way of the intestinal canal, and on a meat diet by way of the kidneys. Before performing the test it is advisable to have the patient on a strict meat diet for two days. The apparatus consists of the following: a graduated glass cylinder, 10 cm. in height and 15 mm. in width, with a flat bottom; a white plate or card with a heavy black line across the centre. The reagent is made up as follows: neutral ammonium oxalate 3.0 grammes, acetic acid crystals 5.0 grammes, water 40.0 Cc. The tube is filled to the 5 Cc. mark with the reagent, and an aqueous solution of calcium oxide (0.02 gramme to the litre) added up to the 10 Cc. mark. The solutions are allowed to mix and the tube placed on the card, so that the black line bisects the base of the cylinder. The fluid is then withdrawn, using an ordinary dropper, until, on looking into the tube, the black line becomes perceptible. The figure reached is the standard for comparison and is, usually, 2.4 Cc. The test is now repeated, using 5 Cc. of the reagent and 5 Cc. of urine. The height of the fluid, when the line becomes visible, gives the calcimetric index for that urine. Normally this is about 3.2. The following equation is then worked out; the base of this equation is 0.2 (calcium oxide), which is multiplied by 2.4 (the standard) and the result divided by the patient's index, viz.:
$$\frac{0.2 \times 2.4}{3.2} = 0.15$$
. This represents the cal-

ceum content of one litre of the urine examined. In health, on a mixed diet, this may vary from 0.0-0.6, while on a vegetable diet it may approximate 0.2. Over 0.9 speaks most positively for de-mineralization and the probability of the development of tuberculosis.—Kaufman, in *Archives of Diagnosis*.

SYPHILIS

Salvarsan and Neosalvarsan.—In these days the diffusion of knowledge is rapid and advancement in technic is often made in many places at about one and the same time. It has long been recognized that antisyphilitic remedies do not reach the seat of a syphilitic lesion when it is situated in the brain or spinal cord, hence

mercury has been successfully employed by bathing the nervous tissues directly with a fluid containing bichloride.

Levaditi, Marie, and De Martel, three leading French physicians, do not employ salvarsan itself directly in nervous syphilis, but, as announced before the *Société de Biologie*, they inject the remedial agent into the veins of a rabbit, using an amount which just stops short of killing the animal. One hour after such inoculation the rabbit is bled, and the serum thus obtained is heated at 55° C. for one hour, when by means of small trephines an aperture is made in the skull on either side of the head, the dura is opened, and 5 cm. of the fluid is injected on each side. In one of the cases they operated upon in which there was general paralysis, convulsions and high temperature ensued, but after four days the patient quieted down.

Gibbard and Harrison, of the British Royal Army Medical Corps, find that syphilis is best treated by three intravenous injections of salvarsan (0.6 Gm.) and ten intramuscular injections of mercury continued over a period of nine to ten weeks.

Signorelli (*Zeitschr. f. Immunitätsf. u. exp. Therapie*, vol. xix, No. 2) finds that the addition of a small quantity of carbolic acid decidedly increases the sensitiveness of the Wassermann reaction. 0.25 per cent. is added to the physiologic salt solution or the serum of the patient is diluted ten times its volume. But this step may just as well give rise to non-specific inhibitions.

The Heart in Syphilis.—Syphilis of the heart is commonly regarded as a rare clinical manifestation of that disease. Dr. Harlow B. Brooks, of New York (*Amer. Jour. Med. Sci.*, October), gives his reasons for a very different opinion. True gumma of the heart is uncommon; but autopsies show that 66 per cent. of luetic deaths among his cases have been directly or indirectly due to syphilis of the heart or the circulation. During life the most frequent manifestation is rapidity and irregularity of action, induced by very moderate fatigue. He believes that the heart is affected very early in the disease, frequently even before the secondary rash develops. This depends more on the intensity of the disease than on its duration, and may not manifest its symptoms until years later. Treatment may be with any of the well-known remedies, but if the heart symptoms are luetic they will yield best to antisyphilitic remedies.

The Wassermann Reaction from a Prognostic Standpoint.—A

series of studies of the serum of nursing mothers and infants leads William Palmer Lucas, of Boston (*Archives of Pediatrics*, October), to the following conclusions: If both mother and child give a positive reaction, the prognosis is bad, the only hope for the child being that it be nursed by its mother. If the child alone gives a positive reaction, it has an active lesion somewhere, and requires correspondingly active treatment. Finally, both mother and syphilitic child may give a negative Wassermann, in which case the father will always give a positive reaction.

Army and Navy Temperamental Fitness.—The serious problem of mental equipment for the services is commanding attention in all countries. Surgeon-General C. F. Stokes, U. S. Navy (*U. S. Naval Med. Bull.*, July, 1913, p. 417), advocates the non-employment of any officer who shows a positive Wassermann reaction, and especially that he be not given high command, as it is a matter of common experience to see cerebral syphilis develop unexpectedly under mental strain. The employment of the Binet-Simon test is strongly advocated.

The Complement Fixation Test in Gonococcus Infection.—This test is being, according to H. L. Rockwood (*Cleveland Med. Jr.*, Dec., 1913), more and more employed, especially in cases considered to be clinically cured, but which show urethral stricture, indurated epididymes, exostoses, rheumatic joints, hydrosalpinx with no pus, hypertrophic veru montanum, etc.

GONORRHOEA.

The Treatment of Gonorrhœa by Means of the Direct Application of Heat to the Affected Part.—A new method of treating gonorrhœal urethritis has been put forward by Harrison and Houghton, owing to the ease with which the *Gonococcus* is destroyed by heat. Clinically, when a patient with gonorrhœa develops pyrexia, the discharge often disappears. Having found that the urethra could tolerate a temperature of even 118° F. if the heat be gradually applied, the heat was, by means of hot water, applied through a double catheter, the outer one being of silver and having no opening at its distal end. The duration of the treatment should be from five to ten minutes. If preferred, an electrically-heated bougie provided with a ther-

mometer could be used. By means of this treatment applied on two or three successive days, then with a day or two let-up, for from four to seventeen days, sixteen cases in various stages of inflammation were markedly benefited, even in one of the cases where an epididymitis already existed.

CANCER

The effort to discover the cause and cure of cancer is without a parallel in medical history. It has been and is characterized by unflagging perseverance, in the face of persistent discouragements. The struggle against tuberculosis, in some respects similar, has been encouraged by partial success, inspiring the hope of ultimate victory; but the results of the campaign against cancer have been meagre, although hundreds of able men are devoting to it their best energies and although it has been supported by an expenditure of money so vast that in a previous generation it would have been deemed incredible.

Prof. John B. Deaver (*Penna. State Med. Soc.*, September, 1913) has set forth the present state of the subject, giving special attention to cancer of the breast, but reviewing briefly the whole field. The prevalence of malignant disease is much greater than twenty, or even ten, years ago, and none of the explanations offered to account for the increase appears adequate. In accordance with the view that the lesions are at first local, the trend of opinion is toward very early and very thorough extirpation of suspicious growths. Even so, the prognosis is doubtful; but prompt and radical surgery seems to offer the best chance of cure, and there is no doubt that the percentage of cases free from recurrence is gradually rising, year by year. This is almost the only ray of light shed upon the dark picture. The causal problem remains unsolved and overshadows all else; for every great victory in the contest with disease has depended upon etiological discoveries.

There is one reason for the increase of cancer which was not mentioned in Professor Deaver's address nor in the subsequent discussion, but which is probably the chief factor: the enlarged number of susceptible individuals. The notable prolongation of human life, during the past sixty years, has been due chiefly to a lower mortality from the maladies of childhood and to the subjugation, partial or complete, of the epidemic diseases, like yellow fever, cholera, and

diphtheria. A much greater number now live through the early decades and reach the age when they are most susceptible to malignant disease, to which many of them succumb. Among the thousands saved by diphtheritic antitoxin, many will die of cancer. Every victory gained over one disease means an increased mortality from some other. Men must leave this stage of life, and, when science closes one gateway, like that of yellow fever, increased numbers must pass through the gateways still open. It is irrational to rebel against the law which compels all to pass from this stage of existence; but it is dreadful to think that so many must make the exit through the torture chamber of cancer.

In malignant disease of the large intestine it is now considered better surgery in cases of obstruction due to malignant disease to make a caecal opening before attempting resection of the growth. Bastianelli has had but two deaths in 44 cases, or 4.5 per cent. In all forms of intestinal obstruction large subcutaneous infusions of saline and dextrose should be employed.

Cancer of the Uterus.—In the diagnosis of this disease many of us regard irregular bleeding as almost an essential symptom of its early stage. Rufus B. Hall, of Cincinnati (*Jour. Amer. Med. Assoc.*), however, draws attention to the fact that when this symptom is present the disease is already advanced to such a point that operation cannot be performed with much hope of ultimate cure. The earliest symptom that should be expected is pruritus vulvæ, and in any woman of middle age this complaint should be regarded as very serious; it is due to a watery discharge that may be scanty in amount, and is unlike ordinary leucorrhœa, being rather of the consistency of beef brine. The next symptom is irritable bladder leading to increased frequency of urination. These symptoms have not been generally recognized as such by general practitioners, and when the later symptoms are discovered the case is often hopeless.

Injections of Benzol in Inoperable Cancer.—Géza Királyfi, in the Clinic of Prof. Baron v. Korányi, at Budapest (*Berl. klin. Woch.*, No. 43, October 27, 1913, p. 1982), has been treating inoperable cases of carcinoma by injecting benzol directly into the tumor, the cancer-cells in the neighborhood of the injection having disappeared in a manner similar to that seen when they are subjected to the X-rays.

Discovery of Germ.—Dr. Bose, Professor of Pathological Anatomy at the University of Montpellier, in France (*Evening Bulletin*, Philadelphia, December 10, 1913), states that he has discovered the microbe, which is of the protozoa type, and found principally in water. Insects, fish, and warm-blooded animals act as carriers. He has traced cases to insect bites and pricks from fish bones, and has found intestinal cancer prevalent in villages where snails are eaten.

Infallible Test Reported.—Dr. E. Robinson, before the Academy of Medicine, Paris (*Marconi Wireless*, November 22), reports an infallible method for determining cancer in the first stages by means of a hypodermic solution. It has been tested 300 times in Paris hospitals with satisfactory results.

Moles and Warts Transformed into Cancers.—Dr. Jean Dartier, before the French Association for the Study of Cancer, referred to the tragic possibilities of the decorative mole, which is again in fashion. He says, "Scratch a mole, and you may catch a cancer." Some moles are harmless, others potentially poisonous, therefore with these, as well as with warts and wens, it is wise to leave well enough alone.

Sugar as Feeding Cancer.—The theory of Dr. de Keating Hart, the French cancer specialist (*Public Ledger*, Philadelphia, May 18, 1913), that cancer development is in proportion to the sugar in the organism, and that patients can be saved by starving the overgrown cells, is not borne out by the investigations of Dr. Wm. L. Clark, of Philadelphia. He thinks the starvation method lacks scientific proof, but that both the fasting and diabetic principles may be wonderfully developed in the future.

In Dr. Hart's fasting process, surgical treatment is followed by the direction of what is known as a fulguration stream of high-tension electric sparks against the affected part, the shock so altering the nutrition as to render the soil less fertile for the proliferation of cancer-cells.

Haema-uro-chrome.—Dr. Theodore G. Davis (*Amer. Jour. Med. Sci.*, June, 1913) recommends the following test in suspected cancer or sarcoma, as "the red haema-uro-chrome of cancer is so pronounced that it astonishes the beginner and occurs even with small growths not otherwise discernible":

To 100 Cc. of urine in a narrow-necked flat-bottomed flask of about 6 fluidounces capacity add 10 Cc. of hydrochloric acid; heat

over a slow fire until ebullition, and when cold add 30 Cc. of ether. Turn the flask upside down several times during the six or eight hours required for the test. In cases of pronounced or extensive cancer the ether will acquire a decidedly red color in as short a time as 20 minutes. The haëma-uero-chrome is undoubtedly produced by the cleavage of haemoglobin by a product of the cancer-cell.

Malignant Tumors.—Those interested in the therapy of malignant tumors will find much of interest in the paper of Prof. Ferdinand Blumenthal, "Der gegenwärtige Stand der Behandlung der bösartigen Geschwülste" (*Berl. klin. Woch.*, Nos. 42 and 43, 1913, pp. 1942, 1993).

HODGKIN'S DISEASE

Otto Steiger, of Zürich (*Berl. klin. Woch.*, No. 46, November 17, 1913, p. 2129), calls Hodgkin's disease pseudoleukæmia, or lympho-granulomatosis (Paltauf-Sternberg).

ANÆMIA

Patients who require operation are frequently found to be anæmic. According to Henry T. Byford, of Chicago (*Surg., Gynæc. and Obstet.*, September, 1913), they may be divided, for practical purposes, into two classes,—those with compensation and those without. Those with compensation may, to a certain extent, be treated as normal. One characteristic is that, after removal of the cause of the anæmia, tonics and good food do not rapidly improve the condition. These patients may be of very fair adipose and muscular development, and these tissues act as an important reserve storehouse. Cases are frequently discovered about the time of the menopause, but these are mere coincidences. Cases without compensation are apt to be misleading. Many are bed-ridden, are able to meet the subnormal demands of that state, but could not do much more. Many cases of chronic sepsis are not anæmic, and bear operation well. Iron, extract of bone-marrow, and small amounts of phosphorus are here useful; but only in emergencies should surgeons operate without a preceding careful examination of the blood.

Anent this subject, Thomas S. Cullen, of Baltimore, divides his cases into those showing 40 per cent. or more of haemoglobin and

those with "less than 40 per cent." He also divides them into those that recovered and those that died, and concludes that patients with relatively low haemoglobin bear pelvic and abdominal operations well if cancer of the uterus be not present.

Benzol in the Treatment of Leukæmia.—Királyfi (*Wien. klin. Wochenschr.*, xxvi, 1913) points out the dangers from the too long use of benzol in the treatment of leukæmia, as the leucocytic count diminishes long after the withdrawal of the drug. Two fatal cases, due to epistaxis, are cited, and it is advised to stop giving the drug as soon as the leucocytic count falls below 20,000. In one of the fatal cases above referred to the leucocytes diminished to 200 per cubic millimetre, and in the other to 460.

From a study of his own cases and the cases reported Drs. Meyers and Jenkins (*N. Y. State Jr. of Med.*, January, 1914) draw the following conclusions:

Benzol is a valuable addition to the therapy of leukæmia of any kind. Its institution is, however, so recent, and clinical experience still so scanty, that definite conclusions as to its intrinsic value should be held in abeyance. It would seem to have no uniform action; in all cases it reduces the white cells, but in some, apparently those with very high counts, it does not reduce the leucocytes to normal, while in case of 100,000 to 200,000 it may give brilliant results with normal white counts, greatly diminished or normal spleen, distinct gain in weight and strength, and loss of fever. On the other hand, we may have paradoxical reactions with falling white counts and gain of strength with no change in the spleen, or we may find decrease of the spleen with persisting high leucocytic counts, or there may be low counts with many pathological leucocytes, or there may occur sudden leaps in the number of white cells. The red corpuscles and the haemoglobin are usually very beneficially influenced. When X-rays can be used in combination very favorable results may be obtained, the blood returning to normal with no persisting myelocytes. It is very probable that the results of benzol-therapy are variable for two reasons: (1) The cases in themselves vary in intensity and in the fundamental pathologic conditions or etiological factors in the bone-marrow, the spleen, or lymphoid system. (2) The results are in some way dependent on the size of the dose of benzol, which dose may be either stimulating or depressing to the tissues

involved, and this dose may be peculiar in a marked degree to each case or individual. We would, therefore, suggest that the effect of benzol should be carefully checked by daily blood examinations so as to gauge the optimum dose, and to forestall any symptoms of benzol poisoning.

TROPICAL DISEASE

Sleeping Sickness.—The Commission appointed by the British South Africa Company (*Lancet*, June, 1913) to inquire into the subject of trypanosomiasis have placed it beyond dispute that the species of tsetse fly which acts as the true transmitter of the sleeping sickness parasite, the *Trypanosoma rhodesiense*, is the *Glossina morsitans*, the same fly which acts as the vector of the infection of nagana, a form of trypanosomiasis met with in South Africa among domestic stock.

DEMENTIA PRÆCOX

Max Theobald (*Berl. klin. Woch.*, No. 47, November 24, 1913, p. 2180) considers it as settled that in many instances dementia præcox may be diagnosed from certain other psychic diseases by logical methods.

HEART-DISEASE

The "auricular flutter" is akin to the auricular fibrillation recorded by the electrocardiograph, and in which a proper preparation of digitalis acts so promptly.

Auricular Fibrillation.—W. B. James and T. S. Hart (*Am. Jour. Med. Sci.*, Jan., 1914) come to the following conclusions after a series of elaborate experiments with the electro-cardiograph: In auricular fibrillation palpation of the radial pulse is a misleading guide to the determination of the condition of the circulation. The pulse deficit is a simple and useful means of following the progress of cases of auricular fibrillation, and of confirming observation on the value of various therapeutic measures, including the activity of various preparations of different drugs. The relative deficit is of value in the diagnosis of suspected cases of fibrillation. The ordinary method of estimating blood-pressure is misleading in cases of auricular fibrillation; it may with advantage be replaced by estimating the average systolic blood-pressure, which gives an approximate measure

of the real systolic blood-pressure. The administration of digitalis elevates blood-pressure in cases of auricular fibrillation.

High-tension.—The long-continued use of nitrites, potassium iodide, and other remedies which lower blood-pressure must be used with caution.

Diastolic Pressure.—The determination of the diastolic pressure, and thereby the determination of the cardiac load, is now recognized as of greater importance than the systolic pressure alone. Louis M. Warfield (*Jour. Amer. Med. Assoc.*, October 4) gives a well-illustrated description of some careful studies through which he concludes that there is both clinical and experimental proof that the point at which the diastolic pressure should be read, when using the dial instrument, is the point where, during the gradual lowering of pressure, the fling of the lever suddenly becomes less; or, better, with the auscultatory method, the point where the clear, sharp third tone suddenly becomes dulled.

ATROPHIC RHINITIS

Scarlet red is gaining favor as a stimulant of epithelial cell formation under diverse conditions, and K. K. Wheelock, of Fort Wayne (*Laryngoscope*, October), reports two cases of apparent cure of atrophic rhinitis, and a third progressing toward recovery. He first cleanses and dries the nasal mucous membrane, then thoroughly applies the ointment. At the outset this is painless; but as the effect progresses smarting and lachrymation are induced. The sense of smell was recovered, and the Schneiderian membrane was restored to its normal color and consistence.

PNEUMONIA

Camphor in Pneumonia.—As a serum or vaccine has not yet been discovered for the cure of pneumonia, any mode of therapeutic treatment which gives better results than the expectant method is of interest. At the meeting of the Brooklyn Medical Society on November 21, 1913, Dr. William J. Cruikshank,⁴ of Brooklyn, read a paper on the treatment of pneumonia by large doses of camphor, which paper was discussed by Dr. August Seibert, of New York City, who has done such a large amount of experimental work on the effect of

⁴ *New York State Journal of Medicine*, February, 1914.

camphor on the *pneumococcus*. Ten Cc. of 30 per cent. camphorated oil in sesamum oil to every 100 pounds of body weight are injected twice daily in adults with unilateral pneumonia, while in children above six, half this amount is employed. The camphor injections gradually reduce the toxæmia and there is an absence of crises in nearly every case. The beneficial effect is explained by the vitality of the *pneumococci* which enter the blood currents and induce the initial chill, being directly or indirectly destroyed by the chemotherapeutic action of the camphor. *In vitro* 1/10,000 part of camphor added to the usual culture media inhibits the growth of *pneumococci*, while 1 Cc. of 20 per cent. camphorated oil given hypodermically in rabbits and repeated every 12 hours after a fatal dose of pneumococci emulsion inhibited the fatal outcome in five out of every six animals experimented upon. The adding of salicylic acid increases the beneficial effects of the camphor.

The history of one of the six cases treated by Dr. Cruikshank, with the method of giving the remedy, may best be given in his own words:

One case, I believe, worthy of special mention because I am firmly convinced that without the administration of the camphor the patient would have perished. The illness referred to occurred in April of this year. Her resisting powers greatly reduced and weakened by a previous severe influenzal infection, the lady, 71 years of age, had been up and about for a period of several weeks when the initial chill ushered in an attack of acute lobar pneumonia which quickly consolidated the whole of the left upper lobe. Prostration was rapid and extreme, cardiac and vasomotor shock predominating from the very first. The toxæmia soon became general and markedly profound, resulting in delirium and extreme restlessness, insomnia, increased respiration, dyspnæa, high temperature, right heart failure, diminished renal secretion, intestinal paresis as evidenced by persistent ballooning of the abdomen, gastric distention, wavering and intermittent pulse and complete absence of cough and expectoration. This condition resisted all classical treatment, but the first injection, given on the second day of the disease, of 10 Cc. of 20 per cent. camphor oil made a decided impression. These injections were repeated every four hours night and day, with the result that the patient recovered in the usual gradual manner, without crisis, which seems uniformly to attend this plan of treatment, and she is now enjoying good health. This desperate case, in my opinion, warranted the giving of the injections at shortened intervals, and, regardless of other rules, I was governed entirely in my administration of the camphor by its effects on the patient's condition. It is interesting, therefore, from the standpoint of the clinician, to realize that the total amount of camphor required here turns out to be about equal to that amount which Seibert thinks necessary, in serious cases, to bring about normal conditions in the shortest possible time. Although the injections in this case were given every four hours, I am convinced that the method which

advocates the use of the stronger solution and longer intervals between doses has its advantages and should, as a rule, be adhered to as follows: A 30 per cent. preparation of camphor in oleum sesami should be used. This can readily be prepared by the local druggist. . . . The physician should always see to it that the solution is of full strength and absolutely sterile. In preparing the remedy the oil to be sterilized should be put in a salt mouthed bottle having a loosely-fitting stopper, the sterilization taking place in a boiling water bath. Whenever the preparation is to be used, it should be drawn (not poured) into the sterilized syringe, care being taken to prevent loss of camphor by volatilization. As soon after the initial chill as possible, 10 Cc. or two and one-half drachms (equal to 36 grains of pure camphor) to 100 pounds of human body weight should be injected hypodermically. This dose should be repeated every 12 hours except in bilateral pneumonia and in severe toxæmia. In those cases the injections should be given every 6 to 8 hours. The syringe used should be a Luer, without rubber washers, of 10 to 20 Cc. capacity, or a phylacogens syringe may be used. I prefer the latter. The site selected for the injection should be the outer thigh or the abdomen. The point at which the injection is to be made should be carefully sterilized by thorough washing and the application to it of tincture of iodine. The injection should be made slowly and the oil gradually deposited below the subcutaneous fatty tissue and not into it. If these simple precautions are carried out there will be no trouble either in the form of abscess, sloughing of the skin, or immediate discomfort following these injections. I have yet to observe the least difficulty in any of those directions.

While it is true that up to the present, in the treatment of the individual, lack of definite therapeutic knowledge has prevented advance beyond the expectant plan, it is equally true that bacteriology has so splendidly and accurately demonstrated the etiology of the disease that prevention of its spread resolves itself largely into a proper appreciation and application of the bacteriological facts. The bacteriologist tells us that the exciting cause of typical pneumonia is the introduction into the system of a micro-organism which he has identified as the *pneumococcus*. He has shown us that this pathogenic germ is conveyed, for the most part, by dust-laden air, and that by reason of that fact it is present at all times in the nose, mouth, and throat of a large percentage of individuals; that it is encountered more frequently in crowded cities than in country districts; that it persists for weeks and months in the mouths of convalescents from pneumonia, and that it reaches the mouths of those who are in the vicinity of pneumonics. Pneumonia must, therefore, be regarded as a communicable infectious disease, somewhat contagious, and should be treated as such. Patients suffering from it should, as far as possible, be isolated. Secretions and excretions, especially the sputum, should be thoroughly disinfected or destroyed. Nurses and other attendants upon pneumonics should prevent the possibility of infection by the frequent use of mouth-washes and the proper cleansing and disinfection of the hands, and they should endeavor to render themselves less susceptible to the disease by obtaining sufficient sleep, food, and fresh air. In all public buildings—theatres, meeting halls, churches, schools, prisons, large department stores, hospitals, and the like—the best sanitation must prevail if we would prevent the spread of pneumonia.

The more I am privileged to observe the surgeon at his work, the more thoroughly do I become convinced that ether pneumonia is probably preventable. When ether is to be used as an anaesthetic, anti-operative gastric lavage, followed

by the proper cleansing and disinfecting of the mouth, nose, and throat, should, when possible, be the rule; indeed, it should become an important part of the operative technic. This, I believe, is especially necessary when it is at all probable that the operation to be performed will be prolonged, or when the intestine is involved in the surgical procedure. When, however, in spite of all our precautionary measures, pneumonia asserts itself, certainly until a proper serum or vaccine has been developed, the lives and health of sufferers entrusted to our care will, in my opinion, be best conserved if we have recourse as soon as possible to the administration of camphor in the manner described.

Dr. Seibert admits that, while the blood can be gradually immunized with camphor, this drug does not influence appreciably the organisms which have colonized in the kidney, the pleura, the endocardium, and the meninges.

To combat pneumococic nephritis, for instance (which develops in many cases), urotropin ($7\frac{1}{2}$ grains in water given to the adult three times daily) is necessary, and is best given from the start twice daily, as a prophylactic measure. Where meningitic, endocarditic, and pleuritic symptoms develop, an addition of 3 per cent. synthetic salicylic acid to the 30 per cent. of camphor in sesame oil, given hypodermically, will reach these organisms and reduce their vitality. Recent clinical observations and Dr. Rueck's animal experiments, detailed in Dr. Seibert's last article on this subject (*Medical Record*, April 20, 1912), prove this. In short, camphor is not a "cure-all" in pneumococic pneumonia, but a valuable aid to the patient in overcoming this infection in the blood current. The sooner the aid is given, the better the chance for recovery. Every hour wasted after the initial chill adds to the pneumococic toxin, and lessens the effectiveness of this treatment. The later the camphorizing of the pneumonic's blood begins, the less valuable this aid, and the more dubious the ultimate result. A pneumonia patient recovering by crisis regains health on account of the immunizing ability of his own body alone, unaided, or possibly in spite of the activity of his physician.

In the treatment of diphtheria with Behring's serum (here curiously called "antitoxin"), it has lately been established that, if injected within the first 24 hours of illness, the curative action is 70 times more effective than when given the next day. Therefore, where in sore throat even the possibility exists that the Löffler bacillus is present, the serum test should be made immediately, to safeguard the patient.

Likewise, if a patient has had a chill, presents high fever and labored breathing, 10 Cc. of a 30 per cent. camphor solution in sesame oil to 100 pounds of body weight, injected under the skin immediately, and repeated every 12 hours, will safeguard him against a fatal outcome through a possible pneumococcic infection. If the chill has been caused by influenza bacilli, the same benefit has been given. If it has been caused by other organisms, no harm has been done.

Dr. Seibert recommends that a sterile 30 per cent. camphor solution in sesame oil, and an all-glass syringe, should, to his mind, be in the outfit of every physician, ready for immediate use, as well as 2000 units of Behring's serum against diphtheria. The general practitioners who attend the pneumonic patients during the first days can alone reduce the high mortality of pneumococcic pneumonia, as well as the entirely too high mortality of diphtheritic infection, by the early use of remedies proved effective by scientific research.

Treatment of Pneumonia.—Pneumonia, both croupous and catarrhal, according to Louis Kolipinski (*Monthly Cyclopedia*, July), yields to the following prescription: Hydrarg. Bichlor., gr. $\frac{1}{2}$; Sulphur. Precip. $\frac{3}{4}$ ij, Aquæ dest. bullientis, $\frac{5}{4}$ iv. Of this a teaspoonful is given, at intervals of two to three hours, day and night. Stress is laid on having the water at the boiling-point when the mixture is made, otherwise the sulphur floats. If free catharsis is not induced after four ounces of this have been taken, or if, at any time, colicky pains occur, half an ounce of castor oil will clear the intestinal tract. External heat for the pleurisy always present and a strictly liquid diet are strongly urged. According to the author, if resolution does not begin at the end of the third or fourth day the treatment is a failure, owing to a complication or to an error in diagnosis.

Pneumonic Hemiplegias.—Hemiplegia may occur during an attack of pneumonia, or may precede any apparent symptom of that disease, by a few hours or by one or more days. Many of the cases recover, and among those that come to autopsy there is rarely found any abnormality, other than an encephalitis. The diagnosis of meningitis during an attack of pneumonia is rarely accurate, the same pathological condition being, as a rule, found. In many cases no local condition can be found in the brain or its membranes to account for the nervous or mental symptoms.—Chas. F. Withington, *Am. Jour. Med. Sci.*, February, 1914.

DENTAL SEPSIS

Pyrrhœa alveolaris, general or diffused, is a frequent and often unsuspected cause of systemic infection. C. N. B. Camac, of Columbia University, writes at length on the subject, citing cases and strongly urging autogenic serum therapy, and, of course, the local treatment of the pus focus. The location of the latter, in many instances, calls for the radiograph. Not rarely there is more than one focus. The coöperation of dentist and internist is very necessary, and, to facilitate it, the dentist should, as a routine measure, take a culture of these pus foci. In this way a proper selection of vaccine can be made for subsequent use, or an autogenic one be made from the culture.—*Am. Jour. Med. Sci.*, February, 1914.

STREPTOCOCCUS SORE THROAT

A severe form of sore throat bearing a direct relation to the milk supply is described by Joseph A. Capps, of Chicago (*Jour. Amer. Med. Assoc.*, September 6). It occurs in epidemics, and is due to a peculiar streptococcus which has been isolated. Enlargement of the cervical lymph-glands is common, and may end in suppuration. Intense faacial hyperæmia, with or without a grayish exudate, is the principal initiatory symptom, while otitis media, peritonsillar abscess, nephritis, arthritis, endocarditis, myocarditis, pleurisy, or pneumonia is a common sequel. Extreme prostration and a tendency to relapse are characteristic, but the most dangerous and remarkable manifestation is peritonitis, which is frequently fatal.

THE SPHYGMOMANOMETER IN TONSILLITIS

Many laryngologists have noted the frequency with which sudden attacks of nephritis occur in patients suffering from tonsillitis. The nephritis is sometimes mild, but in other instances of fulminating type and fatal. Observers speak of its approach as peculiarly insidious: often it is unsuspected until rapidly-spreading œdema or a uræmic convulsion gives alarming proof that the malady is already far advanced. A report from St. Louis tells of a girl of fourteen, the daughter of a physician and carefully nursed, who was under the care of an able laryngologist. The tonsillar inflammation was of the usual type, and

there was no suspicion of intercurrent disease until the abrupt occurrence of a severe uræmic convulsion, which came near proving fatal.

The constitutional disturbance accompanying tonsillitis is often severe and much out of proportion to the apparent importance of the local lesion. Frequently there are fever, anorexia, thirst, and insomnia, together with marked malaise, headache, and backache. These same symptoms are often observed in the first stage of nephritis. Consideration of this fact, together with a study of the clinical reports, led to the formulation of a theory to explain the phenomena referred to above. According to this theory, the renal disease was caused by pathogenic germs finding entrance through the tonsils and in them inducing antagonistic reaction, conservative but ineffectual. The prodromes and early symptoms of the nephritis were not really absent, as assumed: they were present; but, being identical with the symptoms of tonsillitis, they were attributed to that disease, and no other cause was sought. In this way the throat affection masked the more serious malady until it was far advanced. The blood-pressure is but slightly influenced by tonsillitis; but a notable rise uniformly occurs early in nephritis. If, then, the pressure be observed in tonsillar cases, it will furnish most valuable diagnostic data; for a marked increase will signify that the morbid process is affecting the kidneys as well as the throat. A rise in pressure would thus be an early signal giving warning of impending danger, at a time when that danger might be averted by energetic treatment and such things as uræmic convulsions and uræmic coma might be prevented.

An opportunity to test this theory occurred very recently. In a rural section of New Jersey there was an unusual outbreak of tonsillitis, and one physician had more than a dozen cases under his care simultaneously. They followed the usual course and were treated in the usual way. Complications were not suspected, and no effort was made to discover them; but, to oblige a colleague, the attending physician agreed to take the blood-pressure. He was surprised to find a rise of more than 20 mm. in four of the patients, while in the others there was but slight variation. He was now thoroughly interested and examined the urine in every case. Where the pressure was normal the results were negative; but the four patients with increased pressure had albuminuria and tube-casts. They were at once put under active treatment.

No safe generalization can be based upon a small number of cases; but the clinical evidence necessary to establish or to disprove this theory can be very readily gathered. Any physician who has a sphygmomanometer and a patient with tonsillitis can assist in determining the question, which ought to be decided in a few months. Already some corroborative testimony has been offered. If the theory is right, it means a stride forward in diagnosis, prognosis, and treatment. Observation of the blood-pressure will become a routine matter in treating tonsillitis: a rise will signify nephritis; a guarded prognosis and anti-nephritic therapeusis: the absence of a rise will eliminate the danger of renal trouble; justify a favorable prognosis, and inaugurate measures for the permanent cure of the throat disease. Each step taken will be upon the solid ground of demonstrable truths.

AMOEBOIC COLITIS

Though to Shaudinn and Craig (Wm. Van Valzah Hayes, *Amer. Jour. Surg.*, N. Y., September, 1913) is largely due the credit of demonstrating the amœba in the human intestinal tract, Major Rogers, of the English Army Medical Service, discovered the efficacy of emetine hydrochloride in amœbic colitis, and effected a cure by injecting one-half grain of the drug in sterile water hypodermically twice daily for two days, then once daily for two or three days, if necessary.

TREATMENT OF NEPHRITIS BY DESICCATED THYROID GLAND

J. F. Percy (*Jour. Amer. Med. Assoc.*, August 9, 1913) reiterates his statement concerning the value of desiccated thyroid gland in nephritis (*Jour. Amer. Med. Assoc.*, November 9, 1912). Besides using it in the treatment of nephritis, he gives it to nephritic patients about to be operated upon for any reason, and advises its administration for two days preceding operation, two grains six times in 24 hours, to all patients about to undergo genito-urinary operations.

In cases of nephritis two grains are to be given six times daily for one week, and during this time the cases will appear to be worse. At the end of the first week the daily dose is increased to 10 tablets. Hyperthyroidism is rare so long as casts or albuminuria are present. Attention is drawn to the fact that thyroid treatment will not cure the nephritis secondary to some other disease.

Granular Kidney.—Dr. Samuel West, of London, in the Purvis oration (*Lancet*, December 27, 1913) talks interestingly in regard to granular kidneys. While the pathologists have not shown that the kidneys possess an internal secretion, the clinical use of renal extract shows that this remedy acts favorably in chronic disease of the kidneys. Dr. West does not rely on any preparations on the market for the extract, but prepares one from the kidney of the pig as needed. This animal is selected because it is a mixed feeder, and, therefore, better than an herbivorous animal, such as the sheep. The treatment must be long continued, and the headache will often be relieved when other means have failed to overcome this troublesome symptom. Even an albuminuric retinitis may clear up under the use of the renal extract.

New Tests for Indican.—Most all our present tests for indican in the urine are modifications of the method of Jaffe, based upon the decomposition of potassium indoxylsulphate with some strong acid, the oxidation of indoxyl to indigotine, and the extraction of the latter by some suitable solvent.

In order to determine the presence of potassium indoxylsulphate in the urine, Tiberio (*Annali di Medicina Navale e Col.*, xix, vol. i) proceeds as follows: In case the urine is turbid, containing mucus or biliary pigments, it is clarified through the addition of a few cubic centimetres of a 5 per cent. solution of neutral lead acetate and filtered. About 5 Cc. of the clear urine are mixed in a test tube with an equal quantity of concentrated hydrochloric acid. To the mixture are added 1 to 2 centigrammes of perborate of soda in substance. Small gas bubbles are at once seen covering this substance. Now close the test tube with the finger and turn the tube upside down a few times. If indican is present in abundance the urine will take on a deep blue-purple color. Add 1 Cc. of chloroform—which takes up the indoxyl—and allow the blue solution of chloroform to settle at the bottom of the test tube by standing. If shaking is continued a couple of minutes, most of the indoxyl will have passed into the chloroform. The portion above the level of the chloroform continues to show a rose color with a slight tinge into violet, a coloration due to scatoxyl, which is insoluble in chloroform. Admitting with Brieger that most of the indol is formed during putrefaction in the large intestine, and that scatol is formed in the small intestine, an

approximate idea may thus be formed of the intensity of the processes of putrefaction going on in either, by the intensity of the color reaction shown in the chloroform solution on the one hand and that of the supernatant liquid on the other. The test is sufficiently accurate for all clinical purposes.—H. G. Beyer, in *U. S. Naval Medical Bulletin*, July, 1913.

A. Jolles (*Zeitschr. f. physiol. Chemie*, vol. lxxxvii, No. 4), obtains the reaction as follows: To 10 Cc. urine is added 2 Cc. of a 20 per cent. lead-acetate solution. The mixture is then shaken and filtered. To the filtrate is added $\frac{1}{2}$ Cc. of a 10 per cent. alcoholic solution of thymol, 10 Cc. of ferric chlorid-hydrochloric acid (Obermeyer's reagent) and 4 Cc. chloroform. The entire mixture is then well shaken. In the presence of even the most minute trace of indican, the chloroform exhibits violet coloration.

DIAGNOSIS OF NEPHRITIS

It is odd that the life insurance people, actuated solely by commercial motives, have made a valuable addition to the diagnosis of nephritis (F. A. Faught, "Blood-Pressure Primer," Philadelphia, 1913). Many companies required their medical examiners to report the blood-pressure of all applicants for large policies: mostly men of mature age. The inspection of these reports—in doubtful cases held under advisement—showed that among the men having albuminuria and tube-casts some had normal blood-pressure, while others showed a decided rise. The medical director of one company became deeply interested and conferred with those holding similar offices in other companies. Working together, these directors collated a large number of examiners' reports, finding that the rise in pressure was not proportional to the quantity of the albumin or casts, but followed some law hitherto unknown.

They, of course, wished to insure these profitable risks, if it could be done without too great hazard, and so decided to order the examiners to hold as many of them as possible in suspense, in the meantime persuading them to undergo treatment to correct the abnormal urinary conditions. A majority of the men remained under observation with the following result: Those who had high blood-pressure improved but little; the albumin and the casts proved constant constituents of

the urine, and the men were finally judged uninsurable, as being affected with nephritis. Those whose blood-pressure was normal responded to treatment, the urine became free from casts and albumin, no other untoward symptom was manifested, and they were ultimately accepted as good risks. The group of medical directors who had closely followed the incidents agreed that in the cured cases the urinary deposits had been due to disordered metabolism of some sort, which had not lasted long enough to produce organic changes in the kidneys; while in the unimproved cases such organic changes had taken place.

The conclusion to which all this leads is that in the observation of the blood-pressure we have a valuable aid in the differential diagnosis between true nephritis and a simulated nephritis, which is due to incomplete catabolism or other metabolic derangement—a derangement which causes the temporary appearance of urinary casts and albumin, but does not alter the blood-pressure, as true nephritis invariably does. This differentiation is obviously of great value not only in diagnosis but in prognosis also.

Glucose in the Urine.—Sydney W. Cole (*Lancet*, September 20, 1913, p. 859) gives a most sensitive method for detecting small amounts of glucose in the urine. It is as follows:

To 10 Cc. of the protein-free urine in a test-tube add six drops of glacial acetic acid, enough solid phenyl-hydrazine-hydrochloride to cover a shilling, and twice this amount of solid sodium acetate. Heat to dissolve and filter into another test-tube. Immerse this in a boiling water bath for 40 minutes. Turn out the flame and allow the tube to cool in the bath for an hour. The addition of the acetic acid markedly increases the ease with which crystals can be obtained.

Genito-urinary Catarrh.—Liten (*New York Med. Jour.*, March 8) describes a genito-urinary catarrh not due to the gonococcus. Ayers had mentioned infection by the *Micrococcus catarrhalis* as liable to be severe and dangerous. Wood thinks satisfactory differentiation possible only by culture.

DYSMENORRHœA

The close relationship of erectile tissue in different parts of the body is well known, but we too seldom make use of it in attempting to relieve diseased conditions. Dr. Joseph Brettauer, of New York

(*Surg., Gynac. and Obstet.*, September), has, however, recognized a relationship between intumescent turbinates and tuberculum of the septum, the so-called "Genitalszellen" of Fliess, in cases of dysmenorrhœa without demonstrable pelvic lesions. He generally finds these parts hyperaesthetic and abnormally hyperæmic. In such cases, trichloracetic acid, carefully applied after cocaineizing every three to seven days in the interval between two menstrual epochs, will frequently effect a cure. It may be necessary to repeat this once or twice.

VICARIOUS MENSTRUATION

Vicarious menstruation commonly occurs through one of the normal orifices of the body, but D. H. Galloway, of Roswell, New Mexico (*Jour. Amer. Med. Assoc.*, November 22), reports an instance in which it took place through two leg ulcers for four years.

PERIOD OF GESTATION

Some means of accurately determining the period to which gestation has advanced is often eagerly sought. Alfred Baker Spalding, of San Francisco (*Jour. Amer. Med. Assoc.*, September 6, 1913), prefers measurements with a tape measure to those with the pelvimeter and has evolved the following rule:

Measure in centimetres from the symphysis to the fundus and make allowance for "settling," if present. Add two to measurements from 22 to 26 cm., three to measurements between 26 and 30 cm., four to measurements from 30 to 32 cm., and five to measurements over 32 cm. This sum will give the probable week of pregnancy.

SERODIAGNOSIS OF PATERNITY

Mayoral and Jimines claim that emulsions of erythrocytes in isotonic NaCl solution, injected under the skin of pregnant women, produce an erythematous spot within six hours, if the erythrocytes are derived from the man by whom they are pregnant, otherwise not.

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